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A Monthly Journal of Engineering Progress

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MARCH, 1927

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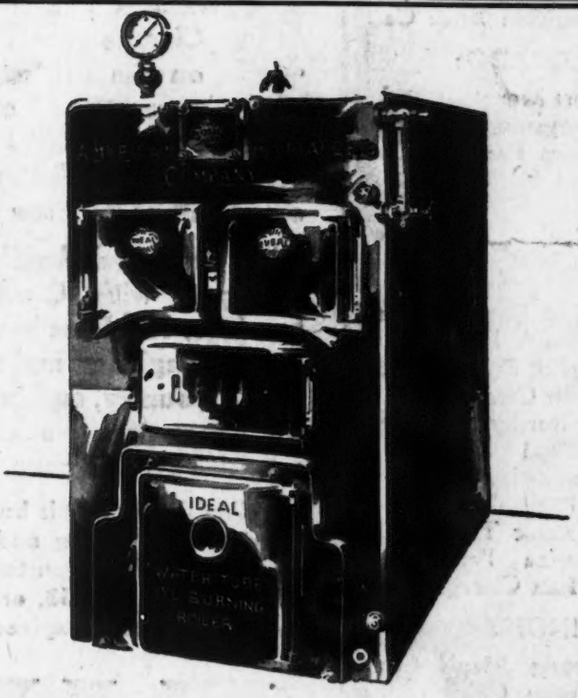

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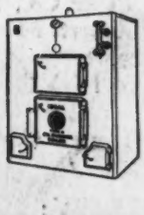

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Contents for March, 1927

Original Design Data for Theatre Air Cooling ..... *S. L. Goodwin* 61
Proven Methods of Figuring Ventilating and Cooling, Based Upon an Experience Covering Some of America's Best-Known Theatres.

Design of a Small Community Heating Plant ..... *Harold L. Alt* 65
Working Out the Calculations and Details for a Central Plant and Distributing Mains.

Church Heating and Ventilation ..... *Alfred J. Offner* 68
Ventilation of Sunday Schools and Social Halls and Choice of Fuels for Church Heating.

New Home Study Course in Gravity Steam and Water Heating ..... *A. M. Daniels* 72
Lesson 23. Steam Heating Systems—Designs and Reports.

Design of Lumber Dry Kilns 75
First of a Series of Typical Arrangements and Calculations Involved in this Specialized Process.

Prize Designs in School Ventilation Contest 77
Layouts Submitted by Winners of Second and Third Awards, with Reasons for Their Selection.

Pipecraft—III 81
Radiator Runouts.
Runouts for Gravity One-Pipe Systems.
Two-Pipe Gravity Steam System.
Vacuum Systems.
Vapor Systems.

The Mechanical Ventilation of the St. Louis Schools ..... *Edwin S. Hallett* 84
Part IV.

True Vapor-Heating Defined 87
An Outline of the Characteristics Which Distinguish Vapor from all Other Systems.

The Largest Low-Pressure Cast-Iron Boiler Installation in the World 89
Operating Data for the Alden Park Manor Buildings in Detroit, Brookline, and Germantown, Burning 19-Degree Fuel-Oil.

1927 to Be Another Big Building Year 91

National Tuberculosis Association Becomes "Uncontrolled Ventilation" Propagandist 93

Warm Air Furnace Heating ..... *A. M. Daniels* 93

S. R. Lewis Becomes Dramatic Critic 94

Correspondence 95
How Pressure Drop Affects a Heating System Making Necessary the Use of Equalizers.
Flow Versus Return Connection for Expansion Tanks.
Function of Expansion Tanks in Steam Heating System.
Hands Across the Sea.
Likes Community Heating.

American Society of Heating and Ventilating Engineers 99
Design and Operation of Hotel Heating and Ventilating Systems.
Turbulence and Heat Transfer.
White Sulphur Springs Selected as Summer Meeting Place.
Committee Appointments.
Illinois Chapter Discusses Research Laboratory Activities.
New York Chapter.
Michigan Chapter Discusses Insulation of Buildings.
Western New York Chapter Learns About Certified Heating.

Chicago Oil-Burner Dealers Discuss Local Permit Situation 102

National District Heating Association 103
Program for Forthcoming Annual Meeting.

The Weather for January, 1927 104

Masonite, A Structural Insulation Material 106

Mister Hooley Goes to the Heating Engineers' Annual Meeting 107

Practical Application of Fixed Differential to Vacuum Heating 108
C. A. Dunham Company Works Out Method of Saving Fuel which Combines Temperature Control and Economy.

Legal Decisions 110
Steam Heating Installation as an Extra.
Construction of Option to Return Cooling System
Obligation of Landlord to Furnish Heat.

Grates for Burning Small-Sized Anthracite 111
8. Grieve Grates.

Death of Dr. Jesse T. Duryea 117

Present Accepted Practice in Domestic Oil Burners 118
27. Sundstrand.

Standard Heating and Ventilating Data Sheets 98A
No. 13D3—Radiation Computing—H. & P. C. N. A. Standard Radiation Estimating Table for Providence, R. I.

Engineers' Specification Index, Page 176.
Advertisers' Index, Page 186.

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The Progress of Heating and the Prevention of Heat Waste

First of a Series

The Johnson System of Temperature Control is designed, manufactured, installed and serviced solely and entirely by Johnson Engineers and Mechanics only: assuring thoroughly correct, reliable results permanently.

from Primitive Times

The first use of fire to keep warm was when quite primitive man kept his fire just outside the crude shelter in which he lived. Of course *most* of the heat went to waste in any such scheme. Though we look with sympathy upon the helplessness of early man, and marvel at the present day advance and perfections of heating means and apparatus and comforts therefrom, some of us fail to realize that heat waste remains but little less rampant today than when man began. For heat not automatically regulated today is wasted to the extent of as much as 40 per cent: a startling condition of present day primitive attitude and extravagance when we consider the progress of time and the presence of Johnson Control since the year 1885.

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The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

MARCH, 1927

Original Design Data for Theatre Air Cooling

Proven Methods of Figuring Ventilating and Cooling, Based upon an Experience Covering Some of America's Best-Known Theatres

S. L. Goodwin

By S. L. Goodwin

Air Conditioning Engineer, Office of Thos. W. Lamb, Architect, New York

AIR conditioning in theatres is one of the largest fields existing to-day for inventive genius and for the development of apparatus and appliances for this special application. Three or four years ago the theatre owners in general did not know or appreciate the advantages of having their houses as comfortable in the dog days of summer as in the extreme weather of the coldest days in winter.

As a result, empty —or partially empty — theatres during the summer months were accepted as a natural handicap under which all theatres were forced to operate. Some ran at a loss, others closed altogether. Now, all this is changed. Audiences and capacity houses are no longer dependent on the vagaries of the summer temperatures, and on the hottest nights many theatre patrons hasten to the nearest showhouse to *cool off*.

It is interesting to trace the development in this particular field, going back a decade or so, when the idea had its inception, and following on up to the time when air cooling became generally recognized as a *sine qua non* of theatre construction.

About ten years ago the manager of a New Orleans theatre told the writer that the installation of two large disc cooling fans had resulted in netting him a profit of $1500 a week during the five summer months. Disc fans for summer use, with a combined capacity of 300,000 C.F.M. for a house of 3000 seating capacity, was the first step in the direction of utilizing theatre plants costing from half a million to a million and a half of dollars for twelve months during every year.

Next, the centrifugal fan was tried, and the Tivoli Theatre in Washington

TO-DAY a modern theatre without an adequate air cooling system is as much behind the times as a theatre of five years ago without mechanical ventilation. Mr. Goodwin's wide practical experience in the design of the theatre cooling systems qualifies him to speak with authority on the subject. In this article he presents not only the methods to be followed in this class of work but also descriptions of typical applications which in practice have achieved the greatest success.

installed centrifugal fans displacing 450,000 C.F.M. and giving a velocity of 200 F.P.M. air movement over every seat in the house. This is accomplished by injecting all the fresh air in the front of the auditorium ceiling and exhausting all the air from the rear of the gallery and orchestra so as to produce and air flow of the velocity stated.

Table 1

	B.T.U.
Body Heat—	
3,000 S x 350 B	1,050,000
Roof—	
$100'\text{-}0'' \times 112'\text{-}0'' \times \frac{0.57t}{2HC} \times 25°d$	79,800
Walls—	
$112'\text{-}0'' \times 60'\text{-}0'' \times 2\ Sides \times 0.25t \times 25°d$	84,000
Electricity—	
$\frac{100,000\ W. \times 3.415\ w.}{4f}$	87,900
TOTAL HEAT LOSS in Summer, per hr.	1,301,700

Cooling theatres by mechanical refrigeration, however, is so immeasurably superior to any other method that no other means of cooling need be discussed or even considered. The loss of income if a playhouse is closed four or five months of the year on account of the hot weather—or is run practically empty if it is kept open—makes the universal use of refrigeration an actual economic necessity.

As cooling plants become cheaper in their initial cost and their subsequent operation, refrigerated air conditioning, no doubt, will be extended to the smaller suburban houses. Another thing the use of refrigerated air in theatre work has done is to establish a milestone in theatre ventilation, owing to the fact that, in order to operate at all satisfactorily, only the very best of first-class apparatus can be used.

OBJECTIVES TO BE OBTAINED IN COOLING

In order to secure proper results in planning theatre installations, the engineer must in the beginning definitely understand his objective. What is he planning to do? What is he to accomplish?

In the first place, he must contemplate cooling a theatre during the summer months when the thermometer ranges from 70° F. to 100° F. (dry bulb). In the second place, he must do this with a varying degree of humidity. In the third place, he must be able to do this equally well with audiences running from a few score to several thousands. As nearly as possible, these varying factors should be controlled by automatic instruments.

The engineer must also bear in mind that the dry-bulb temperature is not, by any means, a safe guide for comfort. The writer remembers an instance where, on an opening night in a remodeled playhouse, he was walking through the balcony with the manager, who commented on the comfortable temperature in the building. A dry-bulb thermometer indicated 75° F. but there was no air washer in this installation and the outside temperature was about 20° F., giving a relative humidity in the theatre of about 12%.

Nor is the wet-bulb temperature any more certain. During midsummer the body becomes more or less accustomed to high temperatures and a drop from 90° F. outside to 70° F. inside may be, and often is, too great a change for comfort. This is especially true after persons have become accustomed to heat such as in midsummer or early autumn.

Complaints were made at one time that a certain refrigerated theatre was "damp as an ice box." Investigation showed 70° F. temperature, with a relative humidity of 50%. The air was actually quite dry, but it was too cold, and a number of persons complained of catching colds in this theatre.

As an experiment, the writer tried sitting in the balcony with an outside temperature of 90° F. and the theatre temperature at 78° F. For the first twenty minutes he felt distinctly chilly!

FACTORS INVOLVED

To hold the temperature of a theatre at an even line of comfort, the engineer has two unit factors to consider: (a) a cubic foot of air, and (b) the allowable range of temperature of that air.

The maximum range of temperature is about 14° F.; that is to say, if the air leaves the cooler at 66° F. and returns at 80° F., the extreme allowable variation of heat is being utilized.

Table 2

CU. FT. per Min.	C.F.M.
$\frac{1,301,700\ B.T.U. \times 4\ (Cu\ Ft\ per\ B.T.U.)}{60\ (Minutes\ per\ Hour)}$	87,000
$\frac{87,000\ C.F.M.}{3,000\ (Seats)}$ per Person in Auditorium Allowing 14° Range of Temperature	29

One B.T.U. will raise 1 cu. ft. of air 55° F. Therefore, with a maximum range of 14°, 1 cu. ft. of air will remove $\frac{14}{55}$ B.T.U., or 0.254 B.T.U. If a greater temperature difference is allowed there will be a danger of draughts. From this it can be seen that it requires almost 4 cu. ft. of air displacement to remove a single B.T.U.

Now, if we figure the total heat supplied to the auditorium in B.T.U. for one hour and divide this amount by 0.254, the result will be the required displacement in cubic feet per hour. Another method which allows a little more leeway, is to multiply the B.T.U. to be removed in one hour, by the cubic feet required to remove 1 B.T.U. (which is 4) and the result will also give the cubic feet per hour.

From this may be deduced the general principle that the greater the supply fan's relative displacement, the less liability there will be to cold draughts.

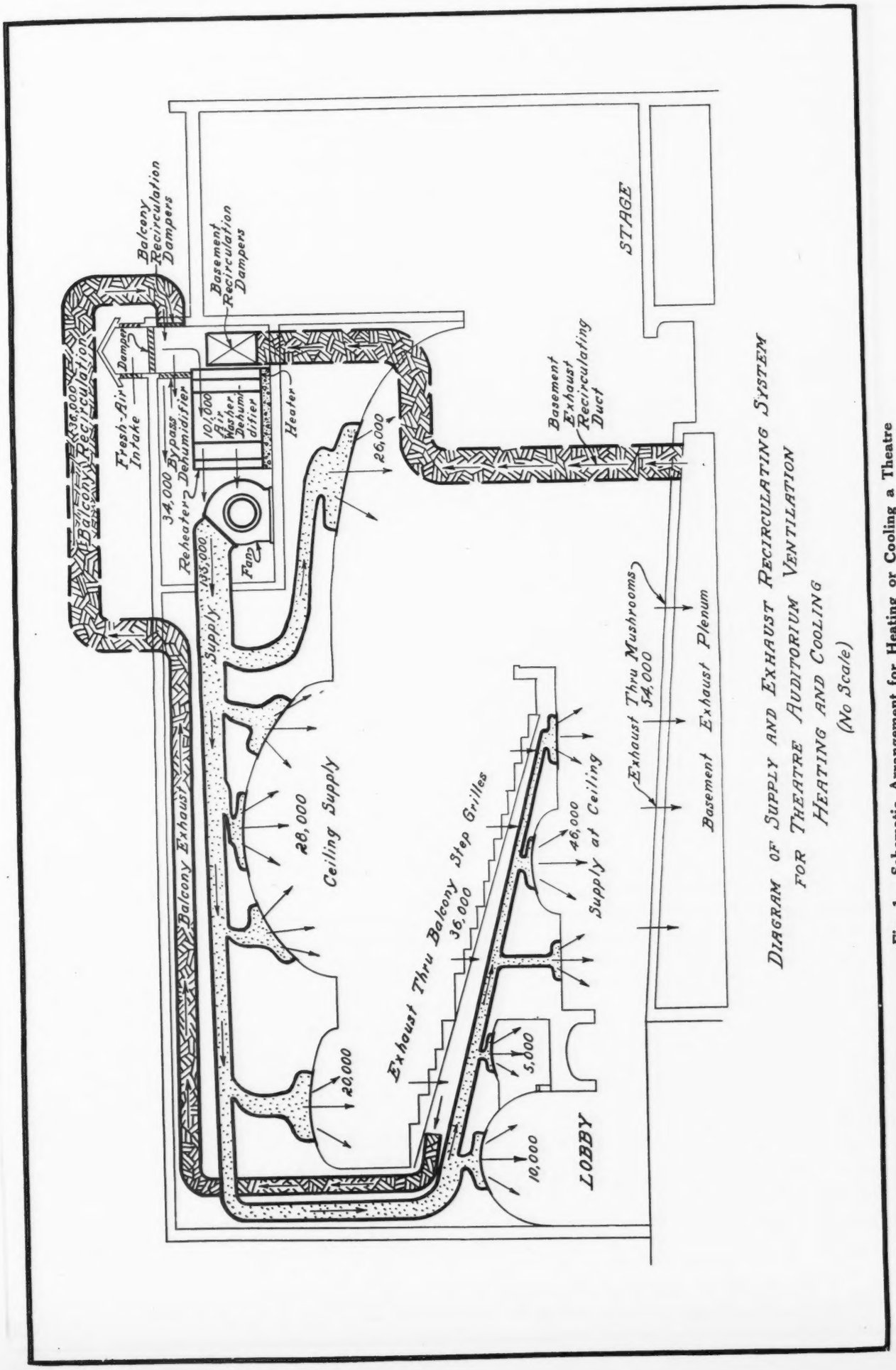

DIAGRAM OF SUPPLY AND EXHAUST RECIRCULATING SYSTEM FOR THEATRE AUDITORIUM VENTILATION HEATING AND COOLING (No Scale)

Fig. 1. Schematic Arrangement for Heating or Cooling a Theatre

CALCULATION OF SUMMER HEAT LOSS AND C.F.M.

In a theatre seating 3000 persons, the heat to be removed in summer weather will be about 1,301,700 B.T.U. per hour, as shown in Table 1, while the air displacement will be 87,000 C.F.M., or 29 C.F.M. per person, as shown in Table 2.

Practical experience has demonstrated that 25 C.F.M. per person is about the least amount of air that will give satisfactory results, and 30 C.F.M. is normal. If winter ventilation only is to be figured, the required C.F.M. will be reduced by the cooling effects of the exterior surfaces and the infiltration of air.

Table 3

Fresh Air Make-Up	
90° E - 55% Rel. Humidity = 6.13 Grains per Cu Ft.	
59° D - 100% Rel. Humidity = 5.56 " " " "	
Water Removed from Fresh Air = 2.57 " " " "	
Supply Fan Capacity	C.F.M.
Small Lobby (wasted)	10,000
Theatre (fresh air make-up, not recirculated)	15,000
Auditorium (recirculated air)	75,000
TOTAL SUPPLY	100,000

CALCULATION OF AIR DISPLACEMENT AND REFRIGERATION REQUIRED

Calculations for approximate air displacement and refrigeration required for a theatre seating 3000 persons, including standees, are shown in Tables 3 and 4. It is assumed that the outside temperature is 90° F., with a relative humidity of 55%; also that the refrigerated air in the theatre will leave the cooler at a temperature of 59° F. and 100% relative humidity (saturated).

Then each cubic foot of fresh air must have the number of grains of water removed, as shown in the first part of Table 3, or 2.57 grains. The second part of Table 3 develops the total quantity of air to be handled, viz. 100,000 C.F.M. It will also be noted in Table 3 that the total fresh (unrecirculated) air is 25,000 C.F.M., this being the sum of the amounts of fresh air supplied to the theatre and the wasted air lost from the lobby.

Based on the amounts and the heat supplied by other heat-emitting sources, Table 4 shows that the total approximate refrigeration required will be in the neighborhood of 217 tons.

Table 5

75,000 C.F.M.	at 59° F.	(3)
25,000 C.F.M.	at 80° F.	(1)
100,000 C.F.M.	at 64¼° F.	(4)

$$59° + \left\{\frac{80° - 59°}{4}\right\} = 59° + 5.25° = 64\tfrac{1}{4}° F.$$

In these calculations the letters used as symbols represent the following:—

A—Area of surface.
S—Seating capacity of auditorium, including standees.
B—Body heat in B.T.U. per hour.
t—Transmission of heat in B.T.U. per square foot per hour per degree difference in temp.
d—Degrees of temperature range.
H.C.—Hung plaster ceiling; approx. ½ transmission.
W—Watts of electric current.
w—B.T.U. per watt, or 3.415.
f—Electrical factor—approx. ¼ load.
R—Percentage of recirculated air.
F—Cubic feet of air raised 1° F. per B.T.U.
T—Tons of refrigeration in B.T.U. per hour.
P—Pounds of water respired per person per hour.
L—Latent heat of water per pound in B.T.U. per hour (approx.).
G—Grains of water per pound.
g—Grains of water condensed per cubic foot of air.
m—Minutes per hour.
E—Exterior air temperature in degrees F.
D—Dehumidified air temperature in degrees F.

(*Continued on Page* 71)

Table 4

Heat Source	Formula	Substitution	Refrigeration —Tons—
Body Heat	$= \frac{S \times B}{T}$	$= \frac{3{,}000 \times 350}{12{,}000}$	$= 88$
Respiration	$= \frac{S \times P \times L \times R}{T}$	$= \frac{3{,}000 \times 0.106 \times 1{,}000 \times 0.75}{12{,}000}$	$= 20$
Roof	$= \frac{A \times t \times d}{HC \times T}$	$= \frac{100 \times 112 \times 0.57 \times 25}{2 \times 12{,}000}$	$= 7$
Walls	$= \frac{A \times 2\ Sides \times t \times d}{T}$	$= \frac{112 \times 60 \times 2 \times 0.24 \times 25}{12{,}000}$	$= 7$
Electricity	$= \frac{W \times w}{T \times f}$	$= \frac{100{,}000 \times 3.415}{12{,}000 \times 4}$	$= 7$
Fresh Air Make-Up (Latent Heat of Humidity Removed)	$= \frac{C.F.M. \times m \times g \times L \times R}{G \times T}$	$= \frac{25{,}000 \times 60 \times 2.57 \times 1{,}000 \times 0.75}{7{,}000 \times 12{,}000}$	$= 35$
Fresh Air Make-Up (Dry Air)	$= \frac{C.F.M. \times m \times d \times R}{F \times T}$	$= \frac{25{,}000 \times 60 \times 31 \times 0.75}{55 \times 12{,}000}$	$= 53$
TOTAL REFRIGERATION TONNAGE			217

Design of a Small Community Heating Plant

Working Out the Calculations and Details for a Central Plant and Distributing Mains

By Harold L. Alt

Part II

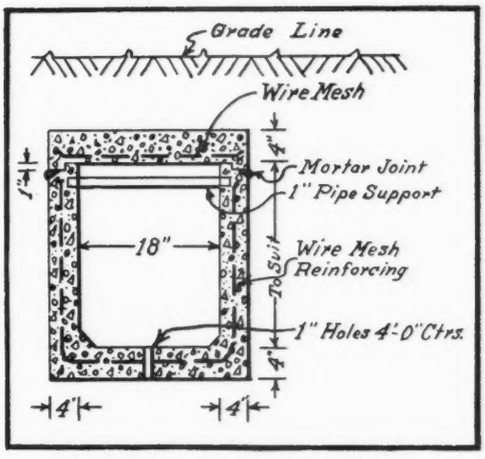

Fig. 7. Detail of Typical Concrete Trench

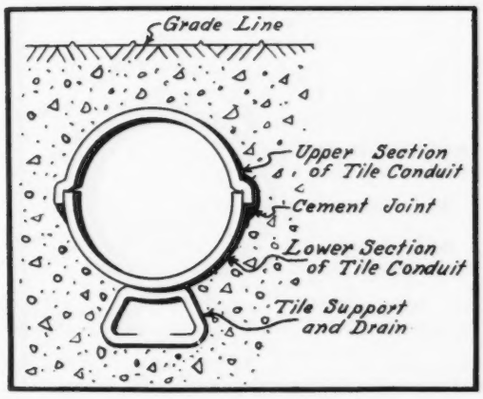

Fig. 8. Detail of Typical Tile Conduit

TRENCHING the steam main is a most important item and permanent trenches are to be most emphatically recommended. This is not only due to the matter of the life of the trench itself, but also to the fact that a solidly built trench provides a stable support on which hangers and pipe anchors may bear.

A more permanent type of trench, and one that is likely to be more water-tight, is shown in Fig. 7, this being of concrete, with the covers made in sections, and the joints cemented and pitched over. Hangers must be provided in this trench for supporting the pipes, and the pipes must be installed before the covers are placed and cemented up.

Still another method is the use of tile conduit specially made for the purpose. This gives excellent results. The tile is made in two sections, with a longitudinal joint along the middle on each side. Hangers and branches usually are made in special concrete or brick manholes. Drainage also is carefully provided for in this construction. A typical view of this design is given in Fig. 8.

RISING AND DRIPPING

The drainage of the condensation from the main must be carefully arranged. It is preferable to have the main pitch down in the direction of the flow of the steam, so that condensation naturally

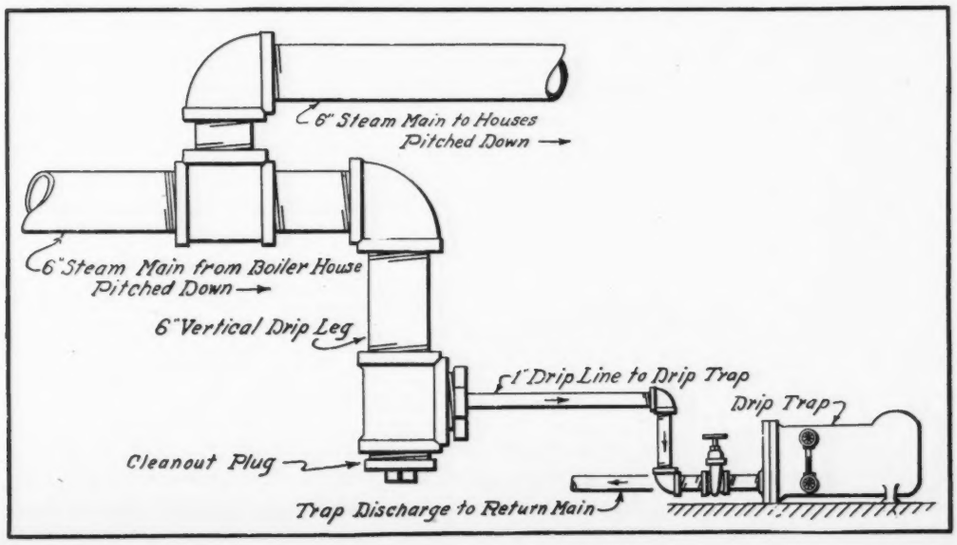
6" Steam Main to Houses Pitched Down
6" Steam Main from Boiler House Pitched Down
6" Vertical Drip Leg
1" Drip Line to Drip Trap
Drip Trap
Cleanout Plug
Trap Discharge to Return Main

Fig. 9. Method of Rising and Dripping Steam Main

will go along with the steam, in the same direction, and not buck the flow. In order to avoid running the main too far down into the ground, it may be advisable to rise and drip the main about every 100 to 200 ft. A detail of a typical rise and drip is shown in Fig. 9.

Each service branch from the main should be valved at the main, and the branch should pitch down toward the house with a trap in the basement to take care of the service line. These traps may be of the ordinary low-pressure type.

The service branches preferably should come off the top of the main, with a swing joint, to allow for the expansion and contraction of the main; also to prevent the condensation in the main from running into the service branch and flooding it. Side connections sometimes are used, but they are not as flexible. A detail of a typical service branch is shown in Fig. 10.

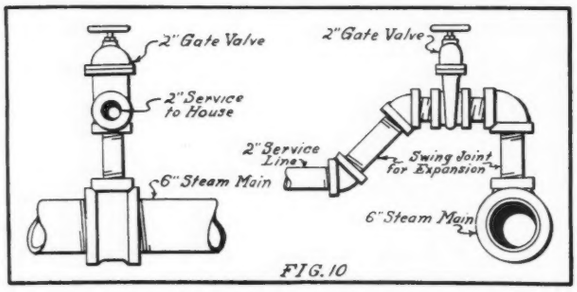

Fig. 10. Detail of Typical Service Branch

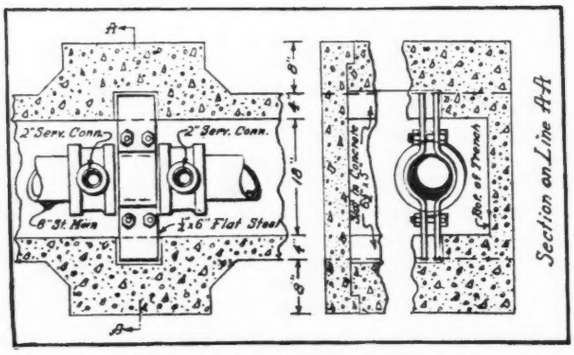

Fig. 11. Pipe Anchor for Controlling Expansion

Expansion also must be taken care of in some way. As steam pipe expands roughly 1 in. per 100 ft. when heated, and, as the main from the boiler house down to the cross main is approximately 400 ft. long, it can readily be understood that an elongation of the pipe will occur when it is heated. Similarly, when cooling off, a contraction of 4-in. will occur.

To provide for this expansion, the simplest solution is to place an anchor midway between the boiler house and the cross main, which will divide the movement in half, 2 in. showing up at elbow into the boiler house and the other 2 in. at the cross main. Such an anchor is detailed in Fig. 11.

At the cross main another anchor should be provided, and should be arranged in such a way that the expansion in the branch main will go both ways from the main junction toward each end of the cross main. But this anchor also must accommodate a 2 in. movement on the main coming from the boiler house as previously has been determined. The detail of an anchor which will do this is shown in Fig. 12. This anchor permits a sidewise movement of the cross main (up to, say, 3 in.) but prevents any longitudinal movement.

On longer mains other methods must be adopted, such as the use of expansion joints (either corrugated or slip type) or by breaking the straight run by an offset or loop. A typical corrugated expansion joint is illustrated in Fig. 13, while the slip-joint type is shown in Fig. 14. The offset method is illustrated in Fig. 15, and the pipe bend method in Fig. 16. The pipe bends are rather undesirable for use on underground work owing to difficulty

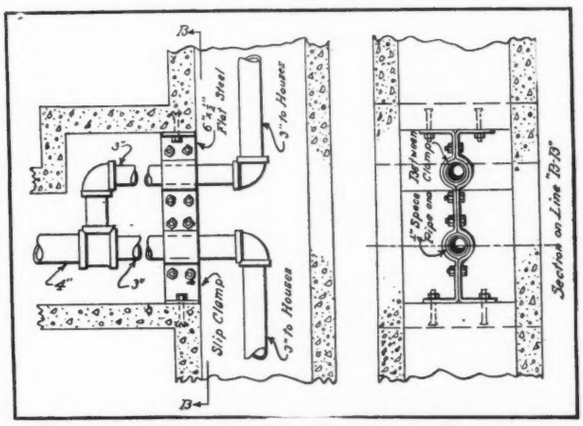

Fig. 12. Pipe Anchor Permitting Movement In One Direction Only

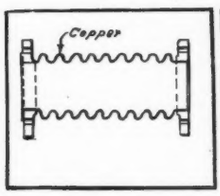

Fig. 13. Corrugated Expansion Joint

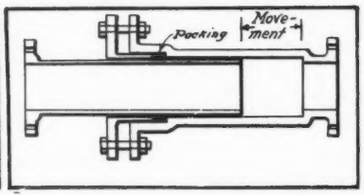

Fig. 14. Slip Type of Expansion Joint

of properly housing the bends in a trench of ordinary construction.

To economize in the cost of trench construction, the return line, if used, may be run on the bottom of the trench, practically level, and opening into a receiving tank in the boiler room. The traps all discharge into this line, which is a wet return, the traps in the houses taking care of the house systems, being three-valve lift traps with operating connections from the steam main, as previously described. The steam-main drip traps are of the common low-pressure type.

Hanging and supporting the steam main must also receive proper attention, just as in any heating work. Rollers should be provided on each hanger, leaving the pipe free to move as directed by the anchors. The return also should be placed on rollers, although of course the movement will not be as great, owing to the lower temperature.

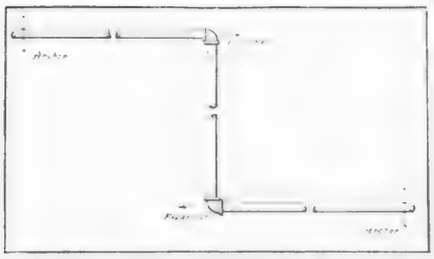

Fig. 15. Offset Method of Providing for Expansion

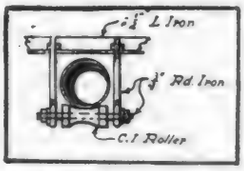

Fig. 17. Good Type of Pipe Hanger

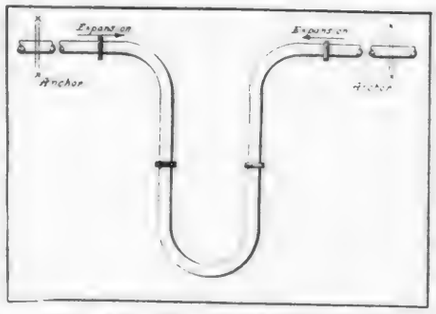

Fig. 16. Pipe Bend Method of Providing for Expansion

A typical hanger of good design is shown in Fig. 17.

Having developed a solution for all the difficulties of steam distribution and the return of condensation, attention might be turned to the boiler house and the apparatus required therein.

It was found that the total boiler load with 20 houses was 10,150 sq. ft. This includes the heating systems in the 20 houses and the losses in the distributing mains. As most plants of this character start with a fewer number of houses and add others later—either as new houses are built or as additional owners desire service—it might be well to assume 20 houses as a present load, with a possible maximum of 60 houses ultimately.

Boilers of either steel or cast-iron (both of smokeless type) may be used. Undoubtedly the first cost of a cast-iron boiler will be less than that of a steel boiler, but it is questionable, with an installation of this size and character, whether steel boilers ought not be used.

With cast-iron boilers, a rating of 12,000 or 13,000 sq. ft. would be necesary, while, with steel boilers, about 125 H.P. would be required. It might be advisable to install two boilers for the first 20 houses, each half as large as the single boilers above mentioned. In this case, one boiler could be used for ordinary weather and the two for severe weather. This also would protect the first consumers against an entire breakdown in service in case a boiler went out of commission from any cause during the winter season.

When other houses are added, another boiler would be necessary, and it has already been ascertained that the total load with, say, 40 houses would be about 17,650 sq. ft. As the first boiler (or boilers) provides for 10,150 sq. ft. of this, the balance to be taken care of is 17,650—10,150, or about 7,500 sq. ft. (This smaller increase for double the service is due to the fact that the main loss remains a constant and is included in the ratings of the first installation). Therefore, the second installation would consist of a cast-iron boiler, with a rating of about 8,000 sq. ft., or a 75-H.P. steel boiler.

When more than 40 houses are ready for service, a third installation should be made, and this will complete the plant. It has already been calculated that 70 houses will result in a load of about 28,000 sq. ft., of which 17,650 sq. ft. is already cared for by the boilers in the first and second installations. The balance of 28,900 — 17,650 is about 11,250, which must be provided for in the third installation. This means an additional boiler of the same capacity as was provided in the first installation.

A typical layout of the boiler house, with space for the second and third installations, is shown in Fig. 18. It will be noted that ample coal storage space is provided, which is a most important item. The front of the premises can be screened by a 7-ft. brick wall with an ornamental iron gate.

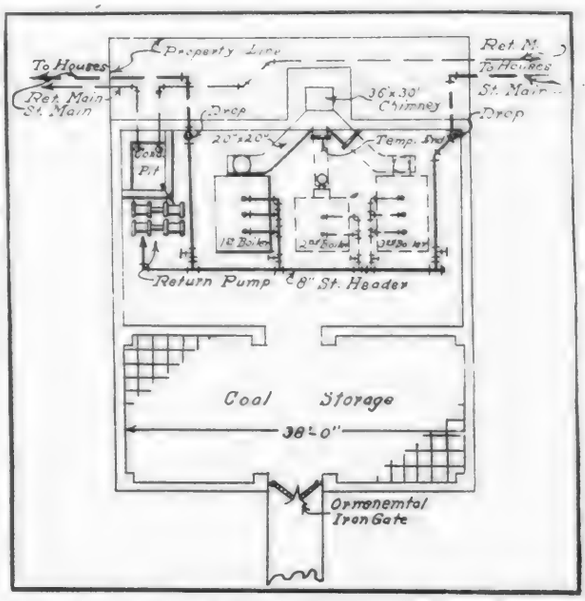

Fig. 18. Design of Small Community Plant Suitable for Requirements Outlined in This Discussion

The chimney, set in the rear of the boiler house, will have to be 85 ft. to 90 ft. high and 30 in. by 36 in. inside. Of course, a circular stack of equivalent area may be substituted with beneficial results.

In places where appearances are of great importance it could be arranged to conceal the boiler house by camouflaging it as a residence, utilizing the basement as a boiler room and the upper floors as apartments for the attendants of the plant. Even the chimney could be carried up through such a residence and made to appear no larger than the ordinary fireplace chimney.

Another detail in regard to the boilers would be that, by putting in one or two extra boilers arranged for oil-burning, advantage could be taken at any time of a variation in price between oil and coal so as to use the cheaper fuel. This scheme has infinite possibilities if capital and proper management can effectively be combined to back the enterprise.

Church Heating and Ventilation

By Alfred J. Offner, M. E.

Offner and McKnight, Consulting Engineers, New York City

Part IV

Ventilation of Sunday Schools and Social Halls and Choice of Fuels for Church Heating

St. Michael's R. C. Church, Jersey City, N. J.

IN this concluding section of the series on church heating and ventilation, the matter of making provision for special rooms, such as Sunday schools and social halls, will be taken up. While these rooms are not part of the church proper, they are connected to the same system, and the subject would not be complete without considering such special requirements.

Except under certain special building conditions, Sunday school rooms and social halls used in connection with churches do not require ventilation. Sometimes, however, it is desirable to provide a simple exhaust system for the kitchen connected with a social hall. Such a kitchen exhaust ventilating system has been installed in Christ Church, Cranbrook, Mich., and is illustrated in Fig. 13, in last month's issue. A small fan unit, with direct-connected electric motor, is hung on the ceiling of the kitchen, exhausting the air through a system of ducts from ceiling registers placed over the steam table and over the coffee urns. A duct connection is also made to the hood over the ranges.

A steam heating system installed in the auditorium of the West Side Unitarian Church, New York City, presented no unusual features, but ventilation was required for the social hall and Sunday school room, due to their location under the auditorium. Fig. 26 shows how the supply and exhaust ventilation was handled. As will be noted, the entire ventilating distributing systems, both supply and exhaust, are located in furred spaces around the sides of the basement.

Air is supplied to the room through registers located on the face of the rise in the ceiling from the furred space to the higher part over the center. Exhaust registers are located on the ceiling under the furred spaces, along the outside wall. The relative locations of the supply and exhaust registers are shown in section in Fig. 26.

The social hall has a cubical contents of 44,600 cu. ft. Both supply and exhaust ventilation are based on six changes per hour. Ventilation of the adjoining rooms was based on the following changes per hour.

	Air Changes per Hour	
	Supply	Exhaust
Men's room	8	6
Ladies' room	8	6
Anteroom	—	6
Sewing room	—	7

Fresh air enters through an opening in the side of the building and is tempered. Independent electrically-driven fans are provided for the supply and exhaust.

GRAVITY VENTS FOR TOILETS

The various toilets are ventilated by gravity vents carried up to the top of the building. Vent flue sizes were figured to meet the requirements of the law in this respect, namely, 144 sq. in. in area.

It will be noted that the ventilation of the social hall of the West Side Unitarian Church, just described, covers both supply and exhaust. Fig. 27, which is also a basement plan, shows this same building provided only with an exhaust ventilating system, the amount of air handled being based on six changes per hour in the social hall. In this case the toilets have been connected to the fan system. Here, the exhaust fan has been hung on the ceiling of the passage leading to the boiler room and discharges through the upper part of the toilet window. Shifting the location of this fan leaves the original fan room clear for other uses.

FUELS FOR CHURCH HEATING

In the choice of fuel for church heating, much depends upon what is available. Wood, coal, oil or gas may be used, the main consideration being the cost of the fuel, the possibility of obtaining it

easily and the question of noise. Where bituminous coal is chosen, precautions must be taken to reduce the amount of smoke to a minimum to prevent defacing the outside of the building.

When oil is the fuel, the heaviest grades that will burn without preheating, should be selected. This will permit the use of the cheaper grades. Those grades which require preheating should not be used in church work as they not only add to the initial cost, but complicate the system, and, therefore, require more skilled operation. The type of help generally found in churches necessitates the simplest systems.

If, by burning oil, labor will be saved, then using oil of the heaviest grade, not requiring preheating, will result in the greatest economy in the cost of operation. If there is no saving in this respect, the whole matter of the comparative cost of oil and coal is problematical. With oil at 9 cents per gallon and allowing for interest and depreciation on the additional expense of the oil-burning plant, anthracite coal must sell for more than $16.50 per ton in order to show a saving in favor of oil.

Gas, of course, is the ideal fuel for heating boilers, its only drawback being its higher cost. With gas at $1.15 per 1000 cu. ft. and having a calorific value of 600 B.T.U. per cubic foot, the expense, in actual practice, would be 80% higher than that of coal at $16.50 a ton.

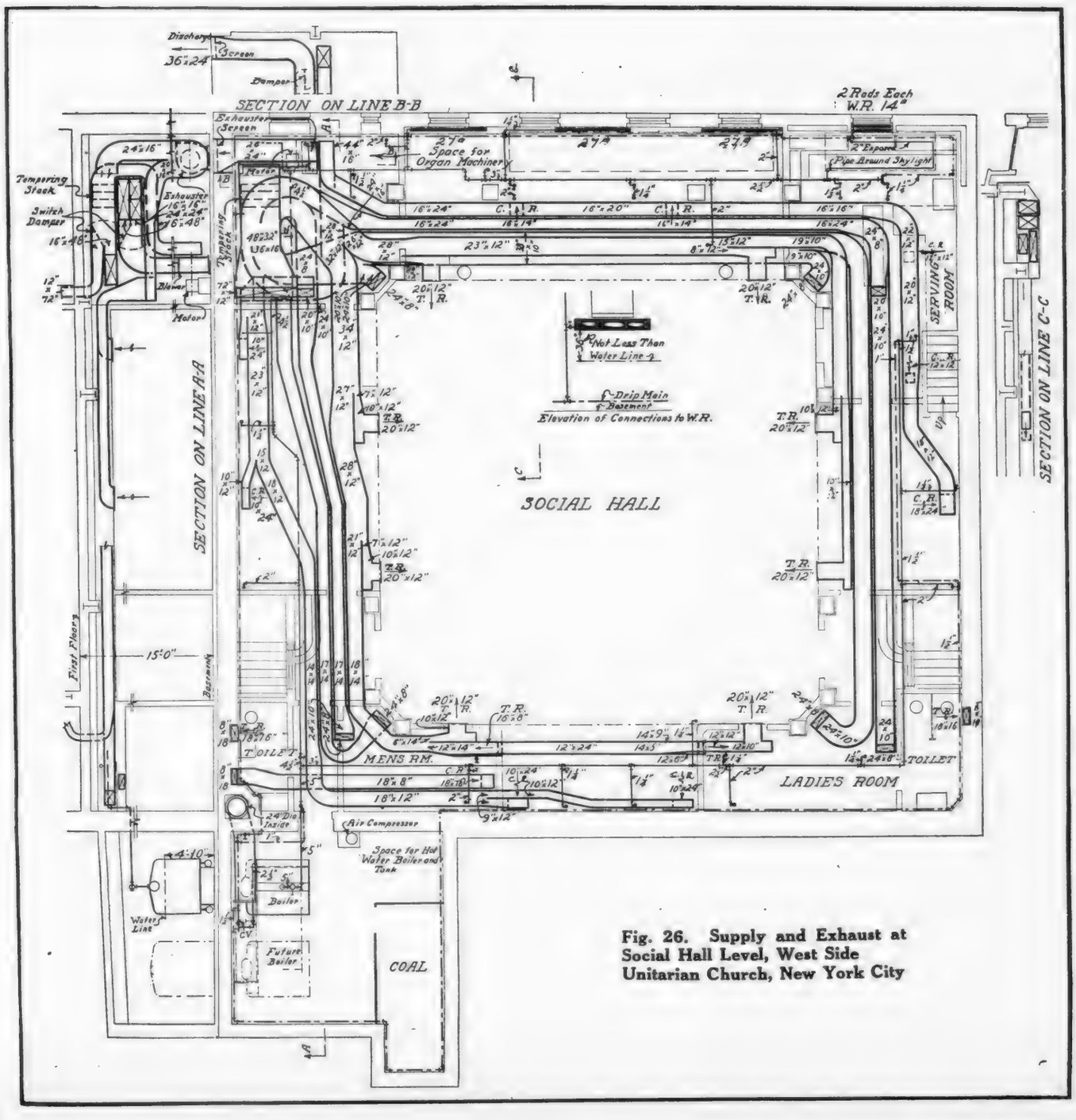

Fig. 26. Supply and Exhaust at Social Hall Level, West Side Unitarian Church, New York City

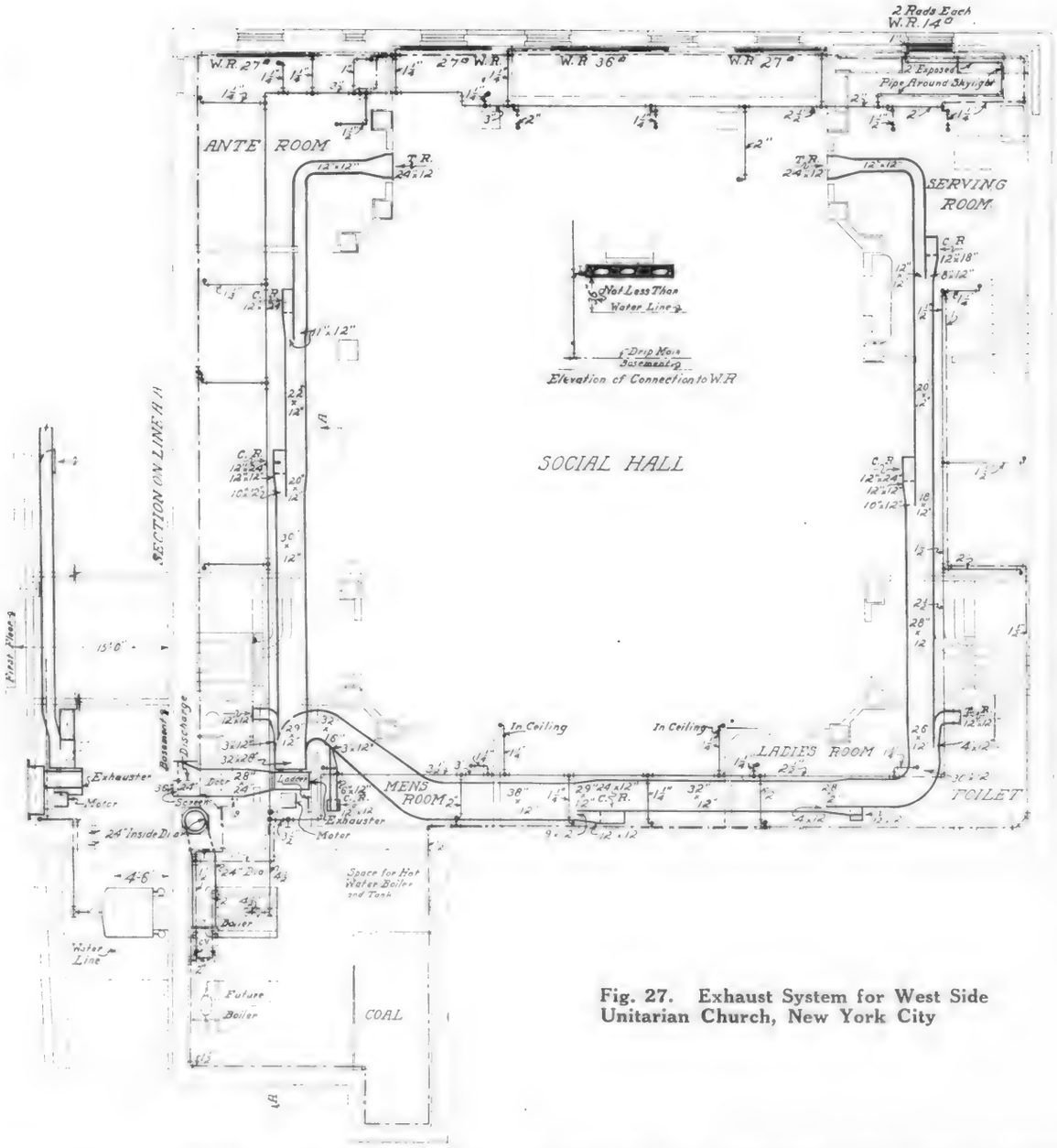

Fig. 27. Exhaust System for West Side Unitarian Church, New York City

ARCHITECTS AND HEATING CONTRACTORS FOR CHURCHES MENTIONED IN ARTICLE

Church	*Location*	*Architects*	*Heating Contractors*
Immanuel Lutheran Church	Whitestone, N. Y.	Matthew W. Del Gaudio, New York City.	Guest & Flugge, Whitestone, N. Y.
Christ Church	Bronxville, N. Y.	Bertram G. Goodhue, Bertram G. Goodhue Associates, New York City.	Howard Plumbing Co., Mount Vernon, N. Y.
St. Luke's Church	New York City	Renwick, Aspinwall & Guard, New York City.	Zibold & Donohue Co., Brooklyn, N. Y.
St. John's Church	Buffalo, N. Y.	Bertram G. Goodhue Associates, New York City.	John W. Danforth Co., Buffalo, N. Y.
Christ Church	Cranbrook, Mich.	Bertram G. Goodhue Associates, New York City.	Eames & Brown, Pontiac, Mich.
St. Michael's Church	Jersey City, N. J.	Wilfred Edwards Anthony, New York City.	Gillis & Geoghegan, New York City.
West Side Unitarian Church	New York City	Hoppin & Koen and A. D. R. Sullivan, Associate, New York City.	Gillis & Geoghegan, New York City.

DESIGNERS AND CONTRACTORS

All of the heating and ventilating systems described and illustrated in this and the two preceding articles were designed in the office of Offner & McKnight, Consulting Engineers, New York City. The illustrations are copies from the drawings prepared by them.

Immanuel Lutheran Church, at Whitestone, N. Y., was built in 1901. It was equipped originally with a warm-air heating system, the heated air being supplied through floor registers located in the center aisle. This system did not prove satisfactory, due to faulty design and installation. In 1925, when this church was altered and enlarged, the steam heating system as described was installed.

St. Luke's Church, which is a part of Trinity Parish, New York City, was built in 1821. Originally it had no heating system. Later, stoves and then warm-air furnaces were installed. This church building, together with the Sunday school building, father's house, parish house, clubhouse and new gymnasium building, is located on the same plot. All of these buildings are now heated by a vacuum steam system from a central plant in the gymnasium building.

Original Design Data for Theatre Cooling

(*Continued from page* 64.)

TEMPERATURES OBTAINED BY MIXING AIR

The resulting temperature evolved by mixing the fresh and recirculated air is computed in Table 5, and figures out 64¼° F. This is obtained by allowing 75% of the air to pass through the cooler and 25% of the air to pass around the cooler, with the assumed temperature of the recirculated air coming back from the theatre as 80° F.

There is also a rule of thumb in more or less common use for determining the amount of refrigeration required, this being 70 tons per 1000 persons, but this rule is modified by any unusual factors, such as extremely large lobbies, or other extreme features. In the particular case under consideration, 3000 x 70 would equal 210 tons, against a computed amount of 217 tons.

TYPE OF VENTILATION SYSTEM USED

The "downward" system of ventilation is generally accepted to-day as the best method to accomplish cooling in an even and desirable manner; it also seems to operate satisfactorily for heating when properly designed. With "downward" ventilation all the incoming air enters through the upper inlets, and all the outgoing air leaves through the lower outlets. The ventilating system, however, whether used for heating or cooling, must be correctly planned or it will be far from satisfactory.

DETAILS OF VENTILATING SCHEME

Tempered air, either cooled or heated, is introduced through the main auditorium ceiling, through lattices, grilles, or through openings in the ornamented plaster work, and at widely distributed points; also, through the ceiling under the balcony for the rear portion of the orchestra floor. (See Fig. 1, for schematic arrangement.)

Air is exhausted through mushrooms under orchestra seats into a basement plenum chamber, and through grilles or registers in the vertical portion of the balcony steps into a balcony plenum chamber.

Where ceilings are low—as in the rear of the orchestra under the balcony—extreme care must be exercised to prevent objectionable draughts. Individual ducts to each outlet in such locations should be equipped with volume dampers, to control the amount of air going to the outlet and the outlet velocity should be kept very low, certainly not over 200 f.p.m. Reflectors or diffusers, which cause the air to spread out horizontally at ceiling perforations, are a preventative of draughts.

STRATIFICATION OF AIR

In one theatre a rather novel difficulty was encountered, caused by the stratification of the air. For this particular building, the supply fan for the auditorium supplied air through a stack of Vento heaters 6 ft. high, into a masonry main supply duct 10 ft. high. From this main supply duct, branch ducts distributed the fresh air to all parts of the house.

A thermometer test of the air in the supply duct showed a difference of 10° F. between the temperature at the top of the duct and the temperature at the bottom. As the air was distributed under the orchestra, the warm air floating on the top came out of the first mushrooms in the rear of the auditorium, while the cooler air, near the bottom, traveled along the duct and came out at the front near the orchestra pit.

Another result was a difference of 5° F. between the temperature at one side of the auditorium and the temperature at the other.

REMEDY OF STRATIFICATIONS

These undesirable features were rectified by the introduction of deflecting branch ducts which took air at different heights from the main supply duct, so as to equalize the average temperature of air delivered to all parts of the auditorium.

Next month Mr. Goodwin will present designs of systems in which one-quarter of the air is fresh and three-quarters recirculated. He will also discuss methods of humidity control and cost of operating cooling systems.

This is the twenty-third lesson of
The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 23—Steam Heating Systems—Designs and Reports

By Ara Marcus Daniels

IN the preceding seven lessons, different types of steam systems have been illustrated and data and tables presented for assistance in designing and installing this character of heating work. The student should realize, however, that no piping schedule can be expected to apply under all conditions. To him who is beginning the study of heating and ventilating engineering and to those who may think that heating is an exact science, capable of being reduced to standard tables and "thumb" rules, let a final note of warning be sounded lest he fall into the pit of sad mistakes.

Seldom is it possible to design and install exactly similar systems. Experienced heating and ventilating engineers realize only too well that every successful and satisfactory plant should have special consideration in its design, that it may properly meet the conditions existing in the particular building to be heated and fulfill the duties for which it is intended.

While many tables have been presented in lessons preceding, they should not be accepted and applied as hard-and-fast rules, but should be taken rather as guides. The size of riser is not alone determined by the size of the radiator it serves; it depends more upon the number of connections and the length of lateral branches.

It is advisable in most cases to design a lateral branch and riser at least one pipe size larger than the radiator valve and when branches and risers are exceptionally long or contain a considerable number of turns, two pipe sizes larger than the radiator valve may be the proper allowance to assure unquestioned service. And when so designed, the reduction in size should be made just at the valve using a reducer or a reducing elbow and nipple.

When cutting, threading and installing pipe, special care should be exercised to see that the work is done in a high-class manner and that nothing is left undone that will assist toward reducing friction of flow to a minimum. The ends of all pipe should be reamed. To fail to observe this requirement is an indication of "sloppy" work. Unreamed pipe can reduce the internal area and introduce enough friction to affect very materially the flow of the heating medium therein. The fitter in charge of installation work should see, so far as is possible, that every piece of pipe is "looked through" before it is placed permanently. Difficulties due to complete stoppage of flow within the pipe itself thus may often be avoided.

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PLANS DESIRABLE

It is in the interest of economy and satisfactorily completed jobs that a piping plan should always be made. Plans thus made should show construction of details clearly. Practically every piece of pipe, for supply and return lines should be clearly shown and each fitting appropriately marked where there is any doubt concerning the ability of the estimator or installer to interpret it correctly. Steamfitters seldom go wrong when they are provided with well-prepared construction details.

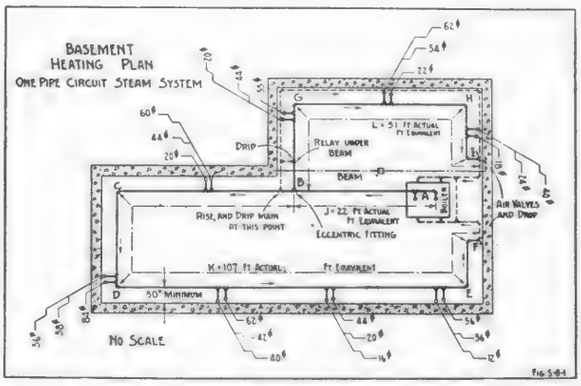

Fig. S-8-1. Basement Heating Plan, One-Pipe Circuit Steam System.

In preparing a piping design, it is best to follow some definite plan of procedure. Undoubtedly, each student who may complete this course of study, conscientiously or unconscientiously, will formulate and follow a plan of action. It is impossible to lay down fixed and unalterable rules for such work—the way only can be indicated—it must be left to the student to decide how best to solve his particular problems. The following is therefore offered as a guide only:

TO PROPORTION THE MAIN

First: Make a preliminary list of the sizes of the pipe required by beginning at the section of the

main which supplies the last group of radiators. In making this list, the size of pipe required to supply the stated radiating surface may be taken from the proper table, disregarding at this time the length of the run. A list of the sizes of the main all the way back to the boiler to accommodate the various radiator groups should thus be prepared.

Second: The list as prepared under *First* should be considered as preliminary only. Using the size as noted and starting at the boiler, the equivalent length of run to each take-off for a riser should be estimated. This equivalent length of main to any riser will be equal to the actual length as scaled from the plans, increased by amounts to compensate for all the various fittings which occur in the run between the boiler and the branch take-off.

In other words, conditions assumed are as if the size of pipe required to supply the radiation at any point (and this includes the radiation supplied to the riser in question and all radiation required between the take-off and the end of main) were to run for the entire distance back to the boiler and were to carry the quantity of steam required for this radiation. To this length is added the equivalent length for each fitting, such equivalent length being based on the size of pipe where the fitting will be located.

Third: Commence again at the last group of radiators on the run. The equivalent length from the boiler to the take-off for this group is now known. If this length is not greater than the maximum given in the table, then no section of the main will be required to supply radiation for a length greater than the maximum, and the preliminary sizes of pipe as found under *First*, above, may be used throughout.

Fourth: If, however, the length found is greater than the maximum given in the table, then a proper correction of allowance for increased length must be applied. This should be done for each group of radiators served until a point along the main where the length is less than the maximum allowed is reached. From this point to the boiler, the preliminary sizes as found under *First* may be adopted.

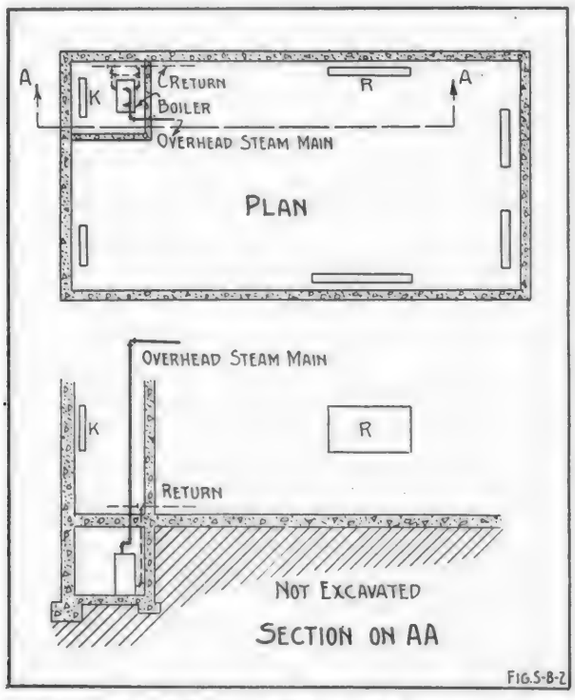

Fig. S-8-2. Small Building Without Basement to be Piped for an Overhead, Downflow One-Pipe Circuit Steam Heating System

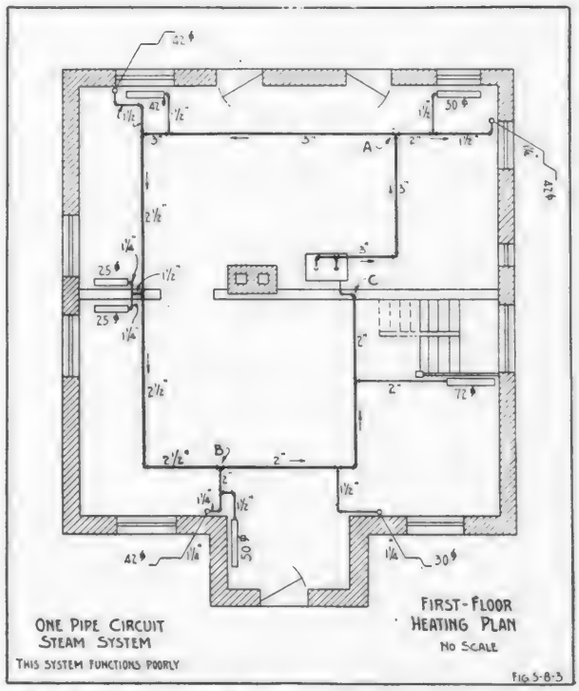

Fig. S-8-3. A Poorly-Functioning One-Pipe Steam System

Considering for the moment a system in which a considerable amount of radiation must be supplied through a long run of pipe, with a definite initial pressure of say 5.3 lbs. at the boiler, there will be a loss in pressure between the boiler and the end of the run. This pressure loss will increase as the quantity of radiation supplied increases and as the run becomes longer. Procedure should be as follows:

First: Select a point on the run which point is at the take-off approximately two-thirds the actual length from the boiler to the end of the main. Assume, for the moment, a pressure drop of 2 lbs. between the boiler and the point in question.

Second: Consider this location as a point of new initial pressure for all piping between this point and the end of the main. This new initial pressure will be equal to the original pressure less 2 lbs. or it may be assumed at 3.3 lbs.

Third: Sizes of all pipes from this point of new initial pressure to the end of the main may be taken from a table giving values for 2 lbs. pressure and sizes from this point back to the boiler may be taken from a table giving values for 5 lbs. pressure.

Note: While 5 lbs. and 2 lbs. initial steam pressure have been used in the above explanation, the method as outlined may be applied in principle for any pressures.

The following modification of the above method for establishing the size of a steam main when tak-

ing the length into consideration should be observed.

A. Make two preliminary pipe size lists—one from the end of the main to the point of assumed new initial pressure (using the proper data) and the other from this point to the boiler (using a proper table).

B. Determine equivalent lengths for each section of run—boiler to point of new initial pressure and from there to end of main—in reality, two separate mains with different initial pressures are assumed and then procedure is as outlined above.

BASEMENT HEATING PLAN

Fig. S-8-1 shows a basement heating plan for a one-pipe circuit steam system which is to be completed by the student. The steam main leaves the boiler at A and continues to B where it branches. The branch B, C, D, E, F supplies the greater amount of radiation. The other branch leaving the main at right angles to the main flow line supplies radiators on line B, G, H, I.

It should be noted that an eccentric fitting should be used at point B, and that relays are required on the B-G and B-C lines in order to pass under the beam and to provide proper pitch for the long run. The student is to determine the size of all piping and note same so that a steam fitter would have all necessary information to install the work. The student will also prepare an enlarged sketch showing clearly the piping detail at point B, the relay under the beam and the relay on line B-C. Note: The work for the following assigned problem should be carefully prepared and preserved, in order that it will be in suitable shape when needed in the estimating part of the course.

Work Problem S-8-1

SIMPLE STEAM HEATING SYSTEM FOR ONE-STORY BUILDING, WITHOUT BASEMENT

Fig. S-8-2 shows a plan view with part section of a one-story building without cellar. The boiler is located in a small excavated part in one corner. An overhead steam main is indicated. All radiators are shown in plan. Two are shown in elevation. The system of piping is to be shown on the plan while in the sectional view the student will indicate the necessary method of piping between radiator R and the boiler in order that all drips from drop risers and the returns from all radiators may be connected directly into the main return without the possibility of short circuiting the steam flow through radiators near the boiler. No traps are to be used on the radiators. No sizes of pipe are required.

Work Problem S-8-2

ONE-PIPE STEAM SYSTEM THAT FUNCTIONS POORLY

The one-pipe steam heating system shown in Fig. S-8-3 functions poorly. The student should study this design and prepare a report thereon as required in the following assigned problem. The system of piping is shown on the first-floor plan. Radiators on this floor are therefore shown in true position with risers to second floor indicated.

A 3-in. steam main is supplied from two steam outlets on the boiler. The steam main grades up to point A, a distance of about 15 ft. from the boiler. This grading up to point A is done on account of insufficient head room to maintain proper grade throughout entire run. At this point a 3 × 2 × 3 tee is used to supply radiators in two directions. The manner in which this tee is placed in the line is usually referred to as "bull-head" style. The 2-in. branch supplies two radiators, a first-floor radiator of 50 sq. ft. and a second-floor radiator of 42 sq. ft.

From point A, the 3-in. branch is graded downward with a pitch of about 1 in. per 10 ft. to a 2½ in. × 1½ in. × 3-in. tee placed in the line in the same manner as the tee at point A. The main is carried 2½ in. as far as point B where it is reduced to a 2-in. line. This size is carried to point C, rather near the boiler, where it drops and is connected into the return.

The system as shown and described does not function properly. The end of the main at C is too near the boiler water-line. The main frequently floods.

Two reports are required. (a) The student is to assume that the drop in pressure at the end of the main, point C, is not too great and to suggest most

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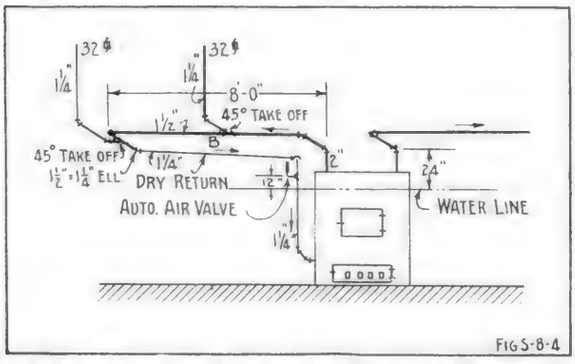

Fig. S-8-4. Piping of Two Steam Radiators Near the Boiler for Criticism and Report by the Student

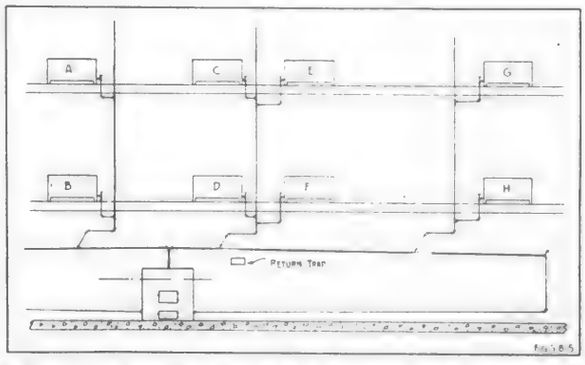

Fig. S-8-5. A One-Pipe Steam System to be Converted into a Vapor System Without Removing Present Piping

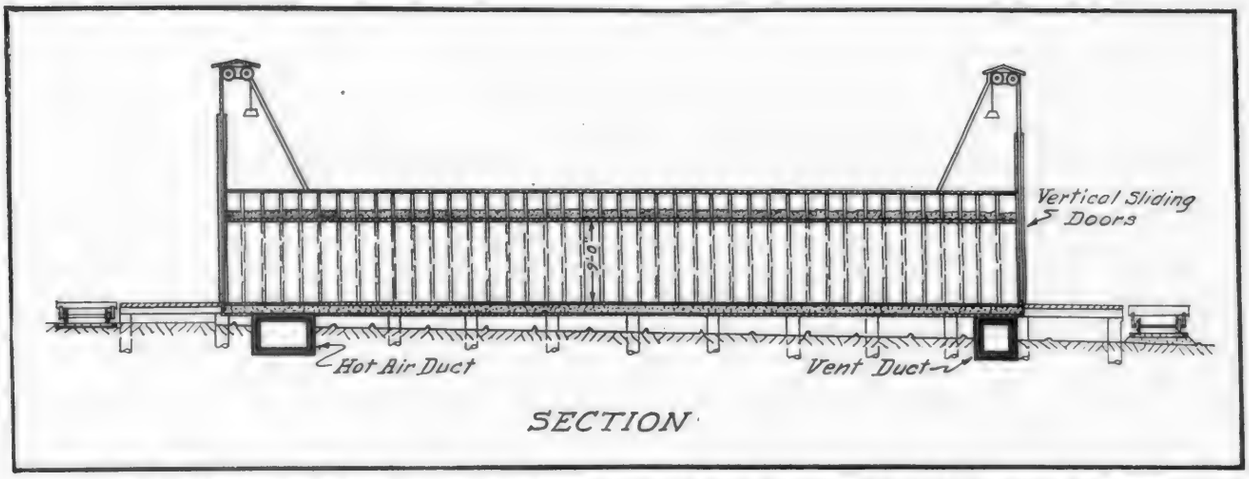

Fig. 1. Elevation of Lumber Dry Kiln According to Design Developed by Buffalo Forge Company

Design of Lumber Dry Kilns

First of a Series of Typical Arrangements and Calculations Involved in this Specialized Process

THERE is, strangely, but little information available in regard to the design and construction of lumber dry kilns. Text books in general pass over the subject with a paragraph or two and then dismiss all further discussion of the matter. It is the purpose of this article to give in detail the methods used by some of the specialists in dry-kiln construction and to demonstrate the proper way to make calculations for such installations.

A HIGHLY-SPECIALIZED SUBJECT

Lumber dry kilns are, more or less, a special development of the heating art. They require special treatment and the heat required is a good deal more than is indicated from the simple calculation of the heat losses from the kiln itself by the B.T.U. method. Combined with this is a certain amount of ventilation or, more correctly, drying, generally involving a fan and a system of ducts, with recirculation and an extremely large heater. Means must also be provided to deliver the lumber into the kiln, retain it there during the drying period so that it will dry evenly and thoroughly, and facilitate the removal of the dried product after it has become sufficiently "kiln-dried."

MODE OF OPERATION

In Figs. 1 and 2, which are presented through the courtesy of the Buffalo Forge Company, is represented a typical dry kiln of standard construction. This kiln is 85 ft. long and has two longitudinal sections each 17 ft. wide, separated by an insulated wall. On the right hand end is noted a "loading platform" which is 10 ft. wide and extends up to the track on which the transfer car runs.

The transfer car carries the lumber piled on small trucks (from the place where the green lumber is stored) up to the dry kiln and delivers these laden lumber trucks onto the "loading platform." When this platform has received all the lumber in the new consignment to be placed in the kiln, the sliding doors at the end of the kiln are opened onto the loading platform and the trucks are pushed into the kiln, after which the doors are again shut.

Assuming that the kiln, in its continuous drying process, is already full of lumber, it can be seen that some lumber must be removed before the kiln could accommodate a new lot. This is accomplished by opening the doors on the opposite (left) end of the kiln and removing as many trucks as are completely dried, after which all the trucks in the kiln are moved up toward the left, leaving a space for the new incoming trucks.

At the opposite, or outgoing, end of the kiln, is another platform (similar to the loading platform) and of the same width. This platform is known as the "unloading platform." Trucks of dried lumber are taken from the "unloading platform" onto transfer cars and delivered to place of utilization or stored.

CONSTRUCTION OF KILN

Lumber dry kilns, as generally constructed by the Buffalo Forge Company, consist of insulated side walls and ceilings, with counterweighted vertical sliding doors at each end. The outside of the walls exposed to the weather are made of double-matched boards while the inside face is of single matched boards. Between the two faces is a 4-in. space which is filled with sawdust.

Ceilings are constructed of a single thickness of matched boards attached to the bottom of horizontal joists and the space between the joists is also filled with sawdust. For the middle wall a construction similar to the outside walls is used

except that one thickness of matched boards is applied to each side of the studs.

Under the floor, at the entering end, is placed a hot-air duct which, in this particular case, is divided into two branches, with four openings into each side of the kiln. At the opposite end of the kiln is placed a vent duct which is also under the floor. This vent duct has only two openings into each side of the kiln, which openings, however, are double the size of the supply openings and, therefore, have the same area.

Each exhaust opening into the exhaust duct has a volume damper so that the air flow through each side of the kiln can be controlled and equalized by manipulating these dampers. Both supply and exhaust ducts are of concrete.

A vent flue with a sliding damper is provided at one end of the exhaust duct, this flue permitting the escape of air outward after passing through the kiln. The other end of the exhaust duct is connected with a duct going back to the heater for recirculation when desired. This recirculation duct is also equipped with a sliding damper.

FAN ROOM PROVISION

For the fan room a small housing is used (see lower left-hand corner of Fig. 2) and the supply duct is carried into this room with a three-quarter housed fan, with bottom discharge set over this duct so as to blow the hot air down into the duct.

On the suction inlet of the fan is connected a galvanized-iron casing running to the heater stacks and causing the incoming air to be drawn through the stacks before being discharged into the supply duct.

Air for the heater may be secured from two sources:—

(a) Fresh air from the outside which enters through the opening above grade, this opening having 12 sq. ft. free area.

(b) Recirculated air from the kiln which comes back through the recirculation duct whenever the sliding damper is opened.

Suppose it is assumed that the requirements for this particular kiln are to dry 10,000 board feet of lumber per day of 24 hours. (A board foot, of course, is 12 in. long by 12 in. wide by 1 in. thick). The capacity of the kiln must be sufficient to contain the daily input for the number of days the lumber must remain in the kiln. For instance, if it takes 14 days for each 10,000 board feet to pass through the kiln then the kiln must be able to accommodate:

10,000 bd. ft. by 14, or 140,000 bd. ft.

Now the actual period which lumber must remain in the kiln varies. Larger pieces require longer drying than small ones, and all pieces require longer drying where a higher humidity exists. Normally the drying process would be slower in summer (due to a higher moisture content in the outside air) than in winter; also pieces 12 in. by 12 in. in size will take a longer time than 7/8-in. boards or 1/2-in. thick mouldings.

As a general thing, lumber is dried in the rough so that pieces less than 1-in. thick are not usually encountered. Two weeks may be taken as an average time for the ordinary kiln-drying process under normal weather conditions.

Remembering the fact that for a two weeks' drying period there must be a kiln capacity of 140,000 board feet, and taking 17 ft. plus 17 ft., or 34 ft., as the total width of the kiln, the length can be computed if the height is known, or assumed.

In this case, let it be assumed that 9 ft. is the total headroom in the kiln. Of course, the lumber cannot go tight up against the ceiling, nor can it come clear up to the side walls, because working

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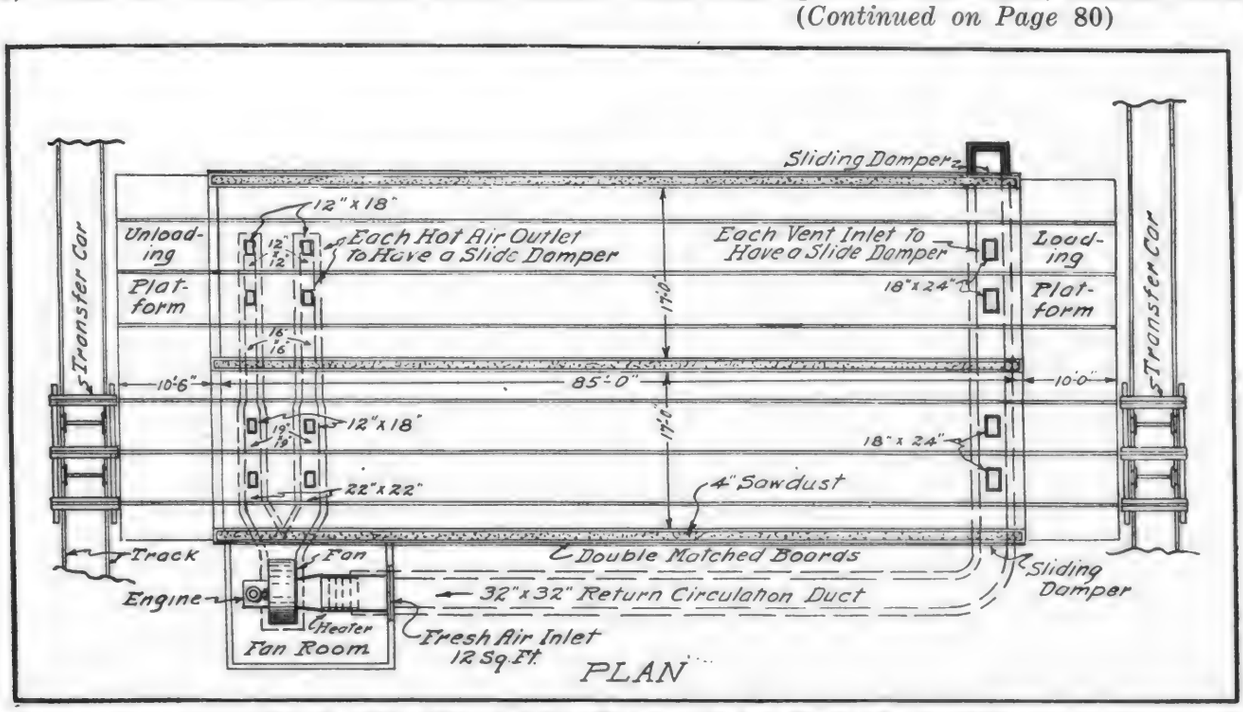


Fig. 2. Plan of Lumber Dry Kiln According to Design Developed by Buffalo Forge Company

Prize Designs in School Ventilation Contest

Layouts Submitted by Winners of Second and Third Awards, with Reasons for Their Selection

Edward C. Ronald, Louisville, Ky., Winner of Second Prize

C. P. Bridges, Hyde Park, Mass., Winner of Third Prize

LAST month's issue of THE HEATING AND VENTILATING MAGAZINE contained the winning design in the competition in schoolhouse ventilation, conducted in the December, 1926, issue, as well as the names of the three prize-winners.

This month we present the second and third best designs submitted. In subsequent issues will appear some of the other solutions, incorporating interesting and novel suggestions.

The winner of the second prize, Edward C. Ronald, of Louisville, Ky., of Lewis and Warren and Ronald, Inc., used a split system of fan ventilation which, he states, was selected by him through a process of elimination. Mr. Ronald states that "gravity ventilation" and the so-called "window ventilation" were both discarded as not being positive and owing to too much variation with the weather conditions.

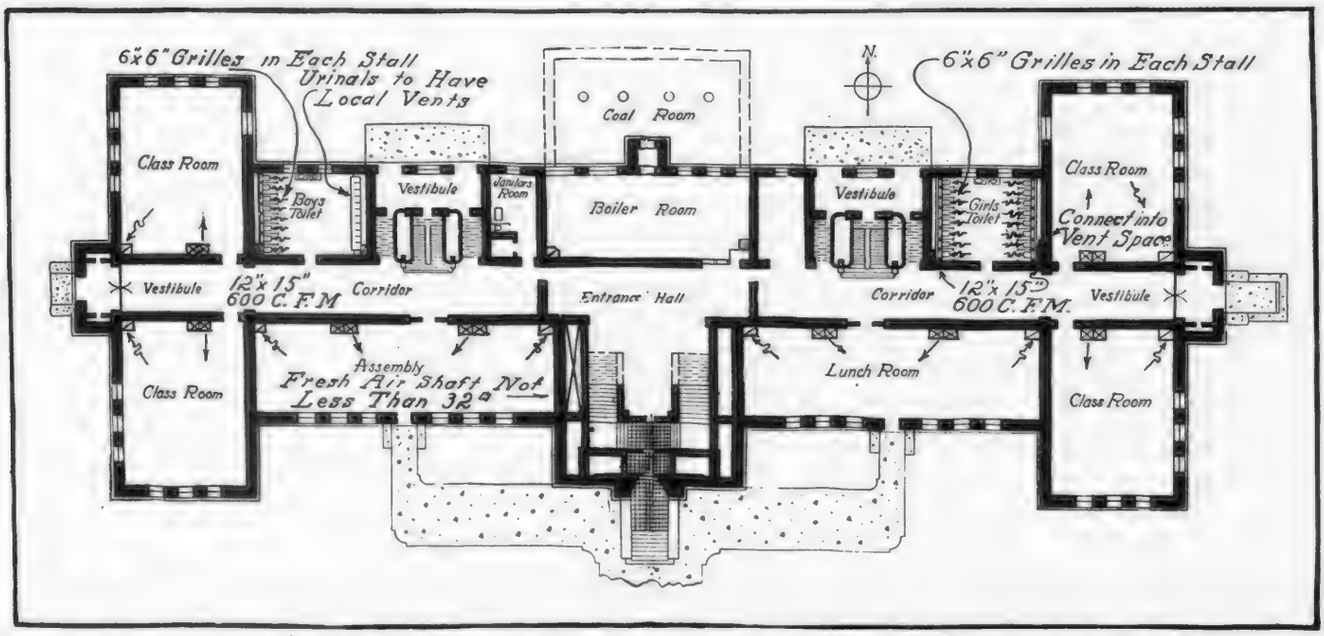


Fig. 1. Main Floor Plan Submitted by Edward C. Ronald

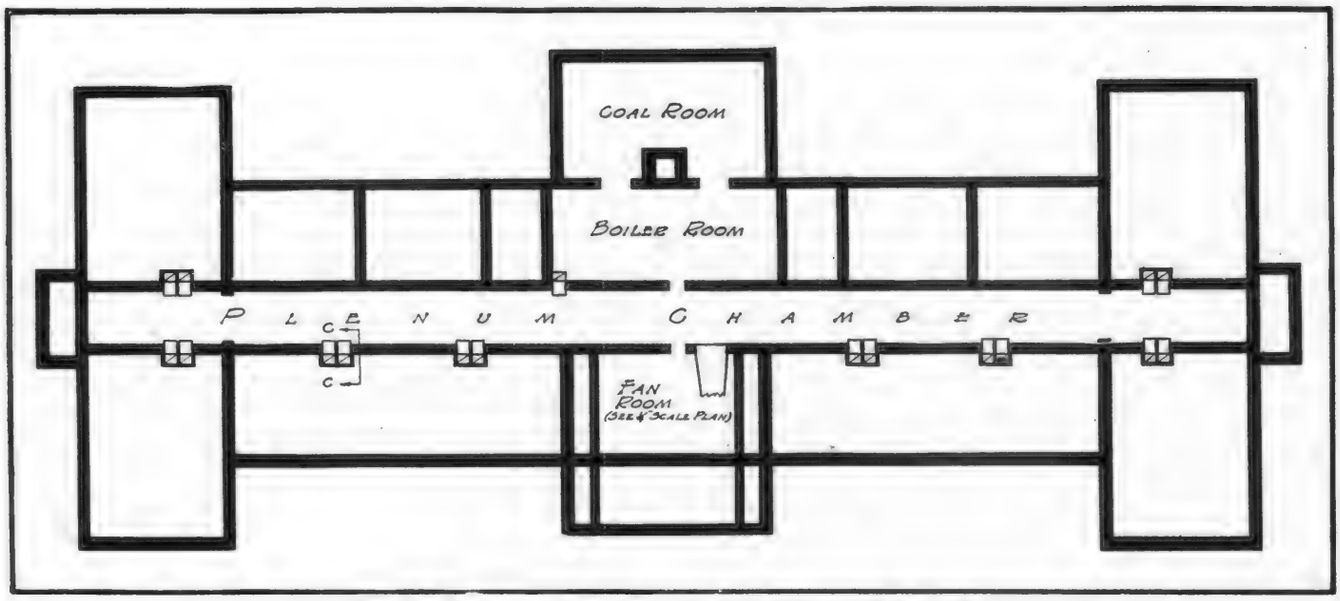


Fig. 2. Basement Plan Submitted by Edward C. Ronald

Fig. 1 illustrates the ground floor plan as submitted by Mr. Ronald. In his questionnaire he states that his air quantities are based on 30 cu. ft. per pupil. In Fig. 2, Mr. Ronald shows his basement plenum chamber which does away with the duct work, except for the risers.

The detail of the fan room and ventilating apparatus is included in Fig. 4. Although partially redrawn for reproduction, Mr. Ronald's drawings were exceptionally well executed, being, in fact, much more elaborate than was demanded by the terms of the contest.

Mr. Ronald's reply to Question 20 was as follows:—

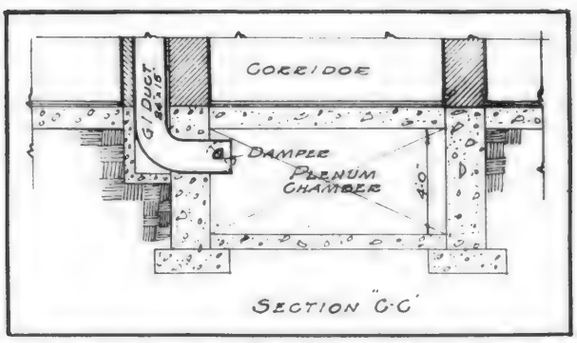


Fig. 3. Detail of Flue Connection Submitted by Edward C. Ronald

"The split system of ventilation was selected for this school by a process of elimination. All forms of gravity ventilation, including direct-indirect and the so-called 'window ventilation' system were rejected because they are not positive enough and the kind and amount of ventilation varies too much with the weather conditions and the exposures of the various rooms. The unit heater system was rejected because it necessitates too many separate fan units and because it provides no adequate and practical means of cleaning and humidifying the air.

"This left the selection between the straight blast and the split systems, the straight blast having the features of eliminating direct radiation in class rooms and also that the fan must be run to give heat. These two features, however, have their disadvantages as well as their advantages. In the split system, direct radiation is placed in the rooms under the windows, which is the only practical means of maintaining a minimum variation in temperature between inside and outside walls. With the split system it is possible to heat the building while school is not in session without running the fan, thus greatly reducing operating costs. Also, in the split system, there are no mixing dampers to stick and give trouble and the temperature can be regulated without fear of drafts just as accurately in mild weather as in cold weather, which is not always true of the straight blast system.

"In addition to the above, this particular design of split system has the advantage over other types of split systems in that all of the apparatus is placed in one room in the basement and also in that there are no horizontal ducts to collect dust and dirt. The plenum chamber, which is practically the only passage through which air passes horizontally, can be scrubbed out with a hose and, because

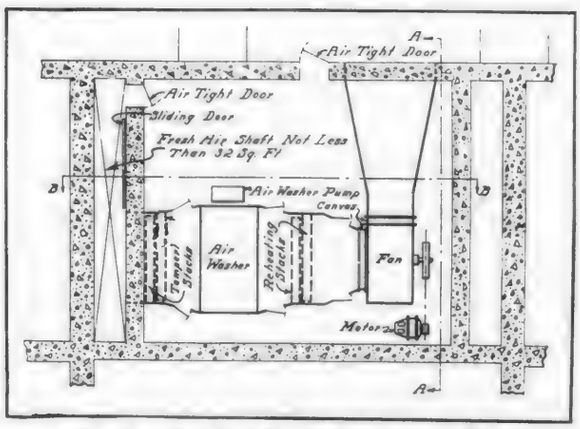


Fig. 4. Detail of Fan Room Submitted by Edward C. Ronald

it is easy to clean, it probably will be kept clean. The fan, air washer, tempering and reheating stacks all being placed in the same room and in close proximity to the boiler room assures that this apparatus will be given the proper attention. There are no volume dampers excepting in the plenum chamber under the ground floor corridor and in the attic space, obviating the necessity of unsightly quadrants or other forms of damper control in finished rooms. Every part of the entire system is accessible for cleaning, repairs and adjustments.

"Because of these reasons, the split system as shown was selected as the best system of ventilation for this particular school."

EDWARD C. RONALD.

The design submitted by C. P. Bridges, which received the third prize, employed unit ventilators and, of course, has no fan room layout. A plan of the ground floor arranged for unit ventilators is shown in Fig. 5.

exhausts from utility spaces and has sufficient capacity to change the air in toilets not less than six times per hour.

"The temperature of every room furnished with a unit is controlled by a compound thermostat. The first point is gradual acting and controls the mixing damper in the unit. The second point is positive acting and controls supply valve on direct radiator. It is set so that supply valve is closed so long as room temperature is above 65°. The duty of heating is therefore placed upon the unit. The direct radiation keeps the room temperate when ventilation is not required.

"A unit ventilator delivering six air changes or more per hour to the room in which it is set will cause the temperature to be equalized throughout the space if there is no direct radiation to contend with. The temperature of air discharged can be maintained at any desired degree or it will respond instantly to any method of automatic control.

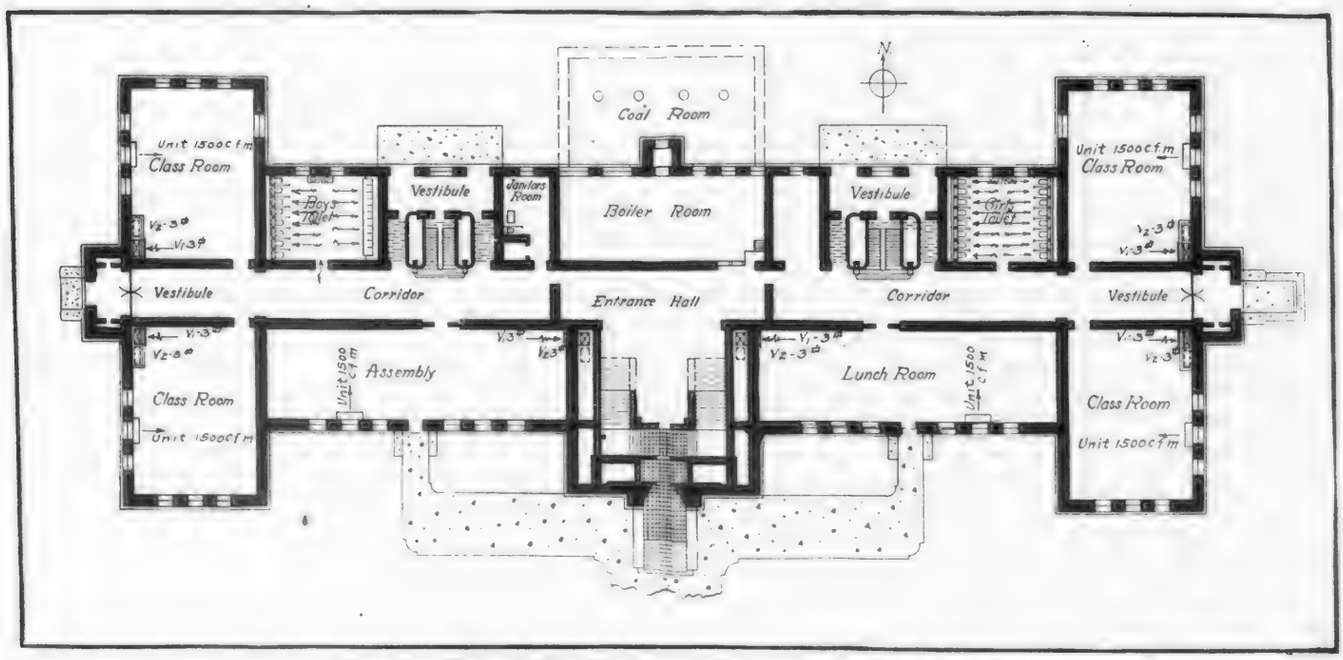


Fig. 5. Plan of Unit Ventilators Submitted by C. P. Bridges

Mr. Bridges's reply to Question 20 is as follows:—

"The contest school building can be well ventilated with either a central fan system or a unit system. Window ventilation, a gravity indirect system, or ozonation will not be discussed. My understanding of ozonation is limited to a general idea obtained from Mr. Hallett's articles. The inadequacy of window and gravity ventilation is so well known that what could be said here would be unimportant.

"The system selected includes direct radiation for vestibules, corridors, toilets, offices, etc., all of which are to be heated to at least 68°. Lunch room, assembly room, and classrooms are equipped with unit ventilators and direct radiation sufficient to heat to 60 degrees when units are not running. Separate gravity exhaust flues are provided for every room having a unit. There is a small multivane exhauster for each tier of toilet rooms. It

"The evenness of temperature and thorough diffusion of the air are surprising to persons unfamiliar with the system.

"The Ohio State requirements for heating and ventilating of schools specify that air with a central fan system shall be introduced horizontally to the room from an outlet not less than 8 ft. above the floor and at a velocity not exceeding 300 ft. per minute. There may be better methods but this is common practice and is a basis for discussion. The inherent troubles are drafts and short circuits of air to vents. Direct radiation is necessary to temper the cold air leaking in through windows and to balance transmission losses and adds to the discomfort of the occupants by overheating parts of the room in order to make other parts warm enough. The system is difficult to control because the cast iron radiation has an inertia to heating and cooling.

"Let us now compare the power requirements of the two systems. Test has shown that 150 watts input are required for a well-known make of unit ventilator of 1500 C.F.M. capacity. The total load for 12 units, or 18,000 C.F.M., is then 1.8 K.W. Assuming the static resistance of the central fan system to be not more than ¾ in., including air filters, an efficient (52 in. diameter) multivane fan of same manufacture as above unit, will require 3.8 B.H.P. The efficiency of motor and belt will not exceed 80% so that the load will be at least 3.5 K.W. The difference in favor of units is 1.7 K.W. or 48.5%.

"The unit system is the more flexible of the two. For example, the lunch room will need ventilation perhaps two hours per day, and the assembly room irregularly, depending upon its use. These two rooms would probably be supplied with fresh air continuously with a split system, because they are not large enough to warrant separate fans. The lunch room may require ventilation when class rooms do not, which implies further waste. The unit system makes possible the ventilation of every room independently of other rooms, a very considerable advantage in economy of operation over less flexible systems.

"Summarizing, we now have three distinct reasons for using the unit systems. They are:

1—Good air distribution and ease of temperature control.
2—Low power consumption.
3—Flexibility of operation with resulting economy in heat and power.

"A fourth important consideration is the psychological value of the unit system. A school teacher, doctor, lawyer, janitor, or any other layman can understand the operation of a unit ventilator. Manufacturers of this apparatus have proven that the unit system has a much greater appeal than the central fan system when both are explained to school boards, superintendents, etc. Understanding of the equipment is a big step towards insuring its proper operation, a very desirable thing for the purchaser, the engineer and the manufacturer."

C. P. BRIDGES.

Design of Lumber Dry Kilns

(*Continued from Page 76*)

space for the men shifting the lumber must be maintained. If the trucks are assumed as 2 ft. high and 6 in. is kept clear between the top of the lumber and the ceiling, the effective depth is 9 ft. less the sum of 2 ft. 6 in., and 6 in., or a net height of 6 ft. (The second 6 in. is for track construction and rail height). See sectional elevation, Fig. 1.

Now 140,000 bd. ft. of lumber occupy a cubic space of 140,000/12, or 11,666 cu. ft. Allowing 50% for separators between pieces and for working space at the ends, this becomes

11,000 cu. ft.
50% of 11,000 cu. ft., 5,833 cu. ft.

17,499 cu. ft., or about 17,500 cu. ft. So, if the cross section of the space occupied by the lumber on both sides of the kiln is 34 ft. × 6 ft. (or 204 sq. ft.) the length of the kiln is easily determined by dividing 17,500 by 204, giving an approximate length of 85 ft. Therefore, the kiln must be not less than 85 ft. long.

Ordinary lumber averages about 45 lbs. per cubic foot in weight and has a moisture content of about 40%. Of this 40% moisture about 33-1/3% will be removed by the drying process or

45 lbs. × 33-1/3%, or 15 lbs. of water.

With this in mind, and a capacity of 10,000 bd. ft. per diem, the number of grains of water per minute to be evaporated is computed as follows:

10,000/12 equals 833-1/3 cu. ft. lumber per day.
833-1/3 × 15 lbs. of water equals 12,505 lbs.
12,505/24 hrs. equals 521 lbs. per hour (plus)
521/60 min. equals 8-2/3 lbs. water per min.
8-2/3 × 7,000 grains equals 60,666 grains per minute.

This may all be summarized and figured accurately in one operation, thus:

$$\frac{10{,}000 \times 15 \times 7{,}000}{12 \times 24 \times 60} = 60{,}000 \text{ grains (approx.)}$$

About the worst air condition that would be encountered for drying would be 70° F. and 100% humidity (saturated), and air at 70° saturated contains 110 grains of water per pound of air. If this air is heated up to about 135° it will still contain the same 110 grains per pound as before, but it will have only about 15% relative humidity, owing to the greater moisture capacity at this higher temperature.

At the 135° F. temperature the air could still take up about 70 grains more of moisture before becoming saturated. In a progressive kiln dryer it will actually absorb about two-thirds of this possible total, or two-thirds of 70 grains, which is about 46 grains per pound, or, stated another way, about 3 grains per cubic foot.

Then the amount of air necessary to be circulated is easily computed to be:

60,000 grains /3, or 20,000 cu. ft. per minute.

In order to have a temperature of 135° F. available for drying, the air must be heated up to about 150° F. at the heater and a drop of 15° F. is allowed for duct and radiation losses.

The drying apparatus required for this kiln would consist of:

One fan, with a capacity of 20,000 cu. ft. per minute.
One heater, capable of heating 20,000 cu. ft. of air per minute from 70° F. to 150° F.
One engine to drive fan.

In cold weather enough air can be circulated through the recirculation duct to make this apparatus amply large by mixing the recirculated air with the fresh air until a temperature of about 70° F. is reached by the mixture of air entering the heater.

PIPECRAFT

PART III

THE risers or drops having been placed plumb and true, their expansion cared for and proper supports provided, it may be felt that this part of the job has been taken care of in a "first-class and workmanlike manner."

Radiator Runouts

The next portion of the job to require attention is the matter of radiator runouts; not a complex subject, but one requiring a certain amount of care and attention if future grief is not desired. It must be kept constantly in mind, while arranging radiator runouts, that the connection of the runout to the radiator involves a fixed and immovable condition, while the connection to the riser involves a movable condition.

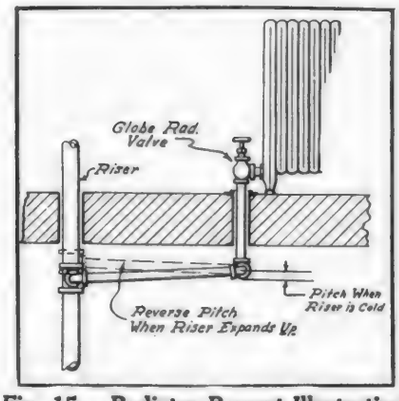


Fig. 15. Radiator Runout Illustrating How Riser Expansion Can Alter Pitch, Gravity One-Pipe Steam System

Therefore, the runout must be so constructed as to let the riser end of the runout move vertically while the radiator end remains practically fixed. As there are several kinds of, and methods used in, heating systems and as such systems employ both steam and hot water for heating mediums, the matter of making runouts for each kind of system must be treated separately.

Runouts for Gravity One-Pipe Steam Systems

Let us consider first the common gravity one-pipe steam system, as this is the simplest steam heating system known, with only one pipe connection to the radiator. Here the radiator runout must pitch down toward the riser to facilitate the return flow of condensation from the radiator back to the riser, for it will be remembered that the one-pipe gravity steam system has the return flowing back in the bottom of the steam supply pipe.

To permit the water of condensation to flow back to the riser against the flow of incoming steam, which is in the opposite direction, a good pitch in the runout must be maintained at all times, even when the riser or drop is hot. Usually the grade of these runouts is specified for the guidance of the contractor, but such grading should be assumed as a minimum grade.

Of course, where the expansion of the riser or drop is *downward,* no difficulty is experienced, but, if the expansion of the riser or drop is in an *upward* direction, then the amount of movement in the riser or drop, at the point where the runout is connected, should be added to the specified grade of runout. For instance, suppose a runout 2-ft. long, with a grade of $\frac{1}{8}$-in. per foot is connected to a riser or drop where the upward expansion movement is $\frac{3}{8}$-in. What happens when the steam is turned on?

The answer is that, when cold, the runout, being 2-ft. long and with a grade of $\frac{1}{8}$-in. per foot, slopes down toward the riser $2 \times \frac{1}{8}$-in. or $\frac{1}{4}$-in. But as soon as the riser is heated it moves upward $\frac{3}{8}$-in., carrying the end of the runout with it. The end of the runout at the riser, which was $\frac{1}{4}$-in. lower than the radiator end when cold, is now $\frac{1}{8}$-in. higher than the radiator end and, consequently, has a reverse pitch of 1/16-in. per ft. ($\frac{1}{8}$-in. in 2-ft.) = 1/16-in. per ft. This is graphically illustrated in Fig. 15.

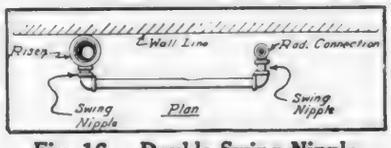


Fig. 16. Double-Swing Nipple in Radiator Runout

The preferable way of installing a runout to a radiator in a one-pipe steam job is to carry the runout on the ceiling below or in the floor construction and then to rise up, coming into the bottom of the radiator valve. This permits the use of a common globe radiator valve of angle type, whereas, if the runout is practically at the same level as the radiator tapping, a straight valve must be used and this must be of the gate type to avoid the damming effect of the valve seat which occurs in every straight globe valve.

It is also necessary to have a double-swing nipple, as illustrated in Fig. 16, between the riser and radiator connection so that the expansion, illustrated in Fig. 15, will not break the connection. When runouts come off the riser at the same level as the radiator connection, other means must be used to take care of the riser movement. Sometimes this is done by means of a 45 deg. offset in the runout, this offset being in a horizontal direc-

tion, as illustrated in Fig. 17. While useless to absorb any horizontal movement, this will provide for a light riser movement by swinging on the nipples A and B as shown.

Where the radiator stands very close to the riser, so close, in fact that it is a practical impossibility to get any sort of a reasonably flexible pipe connection, the alternative exists of running to the far side of the radiator, thus lengthening the runout and getting more spring, while, at the same time, the introduction of swing nipples usually becomes possible.

If the runout is below the floor this is a simple matter, as shown in Fig. 18, but, if the runout is above the floor, it means running the branch back of the radiator,

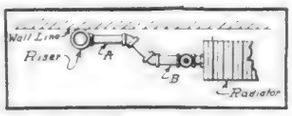


Fig 17. Double Swing Nipple Made up with 45 Degree Ells

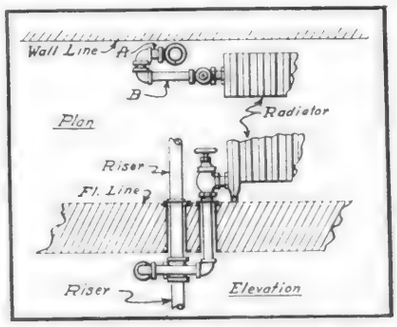


Fig. 18. Introducing Swing Nipples By Starting Off in Wrong Direction

This is largely due to consideration of economy and is the cheapest way to connect up the radiators. It is easily seen that when the steam end is toward the pair of risers (see Fig. 20) the larger pipe (steam-supply-runout) is the shorter pipe and the smaller pipe is the longer; with risers on either side and the steam end of the radiator set toward the steam riser (Fig. 21) it is seen that less piping is used in the runouts than if the radiator is reversed, as shown in Fig. 22, where it is necessary to cross the runouts in order to connect up.

In cases, however, where the radiator is very close to the two

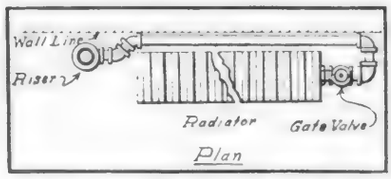


Fig. 19. Providing for Riser Movement by Running the Branch Back of the Radiator

as shown in Fig. 19. Carrying the branch back of the radiator will result in throwing the radiator out from the wall 3-in. or 4-in. and is unsightly; it is better, however, than making such a short connection between the radiator and the riser as to cause the radiator to lift off the floor every time the risers get hot. The writer has seen cases where the radiator has been raised entirely off the floor so that a heavy sheet of corrugated cardboard could be shoved under all four legs, showing that the radiator was being entirely supported by the riser and through the pipe, fittings and valve of a single ¾-in. pipe connection. The strain on these fittings can well be imagined.

Two-Pipe Gravity Steam System

In the two-pipe gravity steam system two general conditions in regard to risers are encountered; the first, when both risers are on the same side of the radiator, and the second, when one riser is on either side of the radiator. Where the two risers are together it is general practice to turn the steam end of the radiator toward the risers, and where the risers are on either side of a radiator it is considered better to place the steam end of the radiator toward the steam riser and the return end toward the return riser.

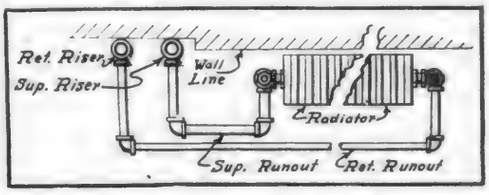


Fig. 20. Two-Pipe Gravity Steam System with Radiator Runouts on Ceiling Below

risers it may be necessary to reverse the radiator end for end, as shown in Fig. 23, this giving a chance for more flexible connections than the method shown in Fig. 19, while a radiator tightly wedged between a pair of risers might require the arrangement shown in Fig. 21 in order to secure the necessary flexibility.

The putting of runouts above the floor for a two-pipe gravity steam job is a very objectionable practice. Such runouts are notorious dirt catchers and it is hard to get the desirable pitch, especially in the return line. They should, in every case where possible, be placed on the ceiling below, which in itself will add greatly to the flexibility of the runout.

Globe valves are permissible on the steam supply to such radiators, as the runouts always slope back toward the riser; but, on the return, if a globe valve is used it must be of the angle type. This is because the return connection carries off the water of condensation from the radiators and must not be obstructed by a straight globe valve seat, as already explained under one-pipe systems.

Vacuum Systems

The runouts for vacuum systems are somewhat smaller in size than for either one- or two-

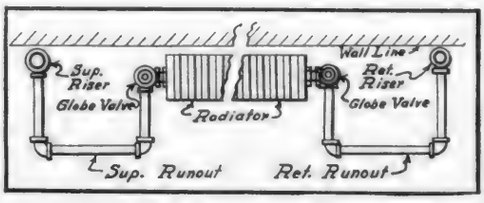


Fig. 21. Connections with Riser on Each Side of Radiator

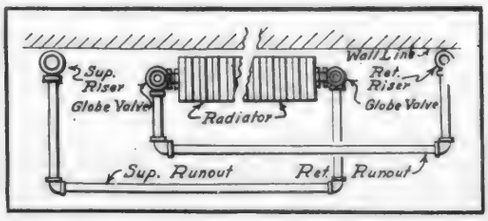


Fig. 22. Runouts Providing for Expansion When Risers Are Very Close to Radiator

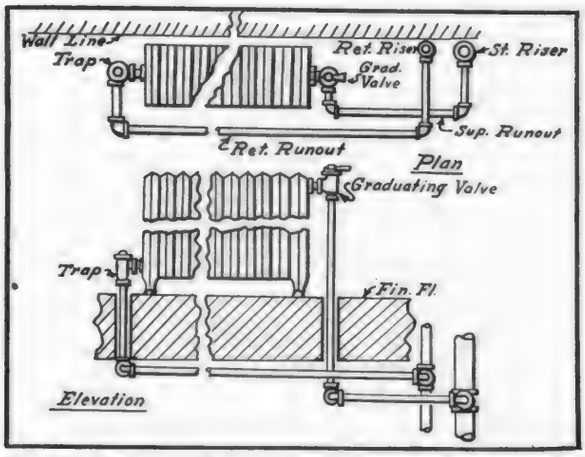


Fig. 23. Typical Radiator Connection and Runout for a Vacuum Job with Risers at One End of Radiator

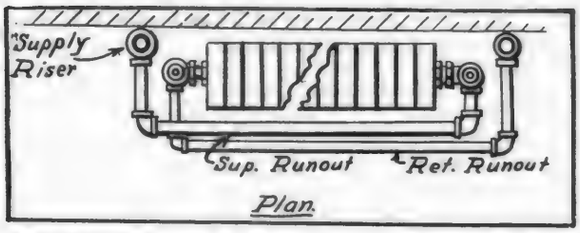


Fig. 24. Typical Radiator Connection for Similar System with Risers on Opposite Ends

pipe gravity systems. For this reason they are more easily displaced from their proper positions after being installed and do not have the same mechanical strength to resist abuse by workmen in the building after erection in final locations. Consequently greater care in hanging such runouts must be exercised and a constant watch kept on them until finally covered up safe from further harm.

A good idea is to place a pipe hanger on such runouts close to the end where they turn up to go through the floor to the radiator. This is not a bad scheme to follow on the gravity systems as well, but it is not quite so necessary there, due to the stronger piping.

In the cases of long runouts of ½-in. or ¾-in. sizes, hangers should be freely used, say on 5 ft. or 6 ft. centers, over to within about 5 ft. of the riser. The last portion of the runout must be left unsupported to provide the necessary spring for movement in the riser.

Vacuum steam system steam runouts have one chief difference from the gravity steam systems in that they are usually connected to the top inlet of the radiator, often employing a graduated valve to control the radiator. The return connection runs to a trap on the return end of the radiator, this trap generally being of the thermostatic character.

In Fig. 23 is shown a typical radiator connection and runout for a vacuum job with two risers at one end of the radiator. If the risers are on opposite ends then the connection will be as indicated in Fig. 24.

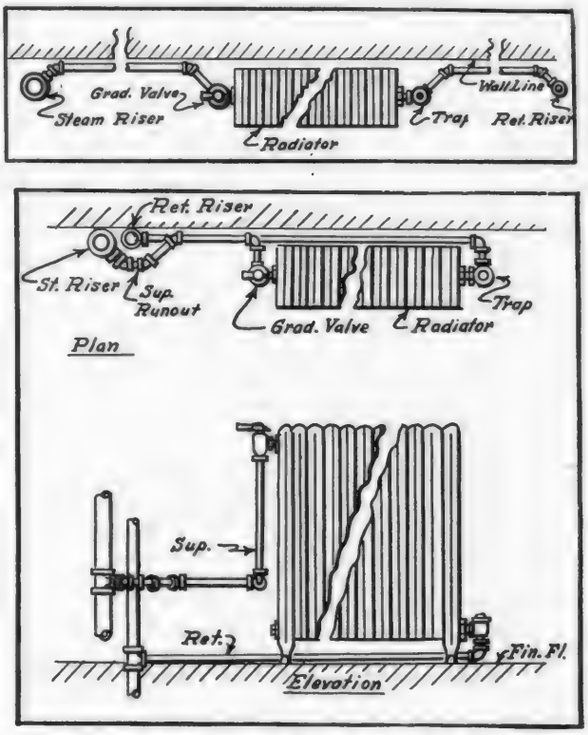
For runouts above the floor Figs. 25 and 26 will clearly demonstrate how these should be treated.

As far as expansion is concerned, the same remarks made under two-pipe gravity systems apply in vacuum systems with equal force.

Vapor Systems

Practically the same details will apply to vapor systems as have already been outlined for vacuum. The pipe sizes are almost the same, the graduated radiator valves and thermostatic traps (if used) are the same. The chief difference between vacuum and vapor is in the fact that a vacuum pump puts a definite suction on the return line, while in vapor only the natural gravity flow is present in the return.

For this reason even greater care must be exercised to avoid any bows or sags in the return line,

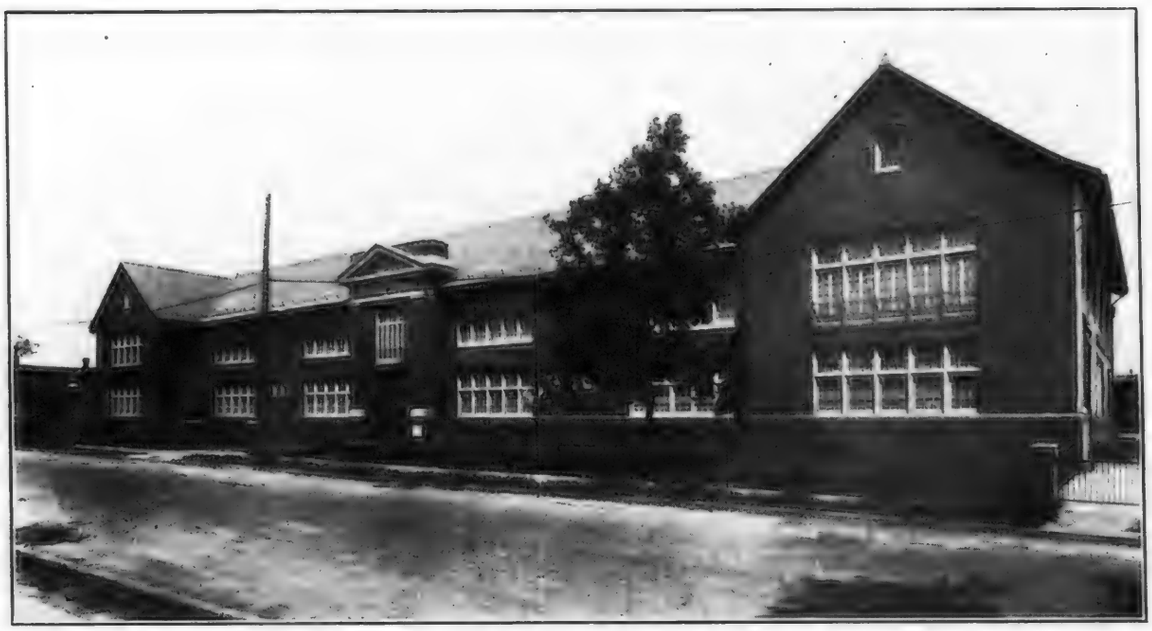


Figs. 25 & 26. Typical Methods of Handling Runouts Above Floor Line

while the supply operating so close to atmospheric pressure makes it necessary to use the same caution on the supply runouts.

Next month's installment will be devoted to hot water runouts, expansion and air venting of down-feed hot water systems.

Of the commercial coking plants in operation in the United States at present virtually all use high-temperature processes. They include beehive ovens, in which the by-products are not recovered; by-product ovens of the Koppers or Semet-Solvay type, and the ordinary gas retorts for the manufacture of illuminating gas. When 1 ton of coal is carbonized in a by-product oven at a temperature of 900° to 1,200° C., the following products are obtained: Coke, 1,100 to 1,400 lbs., gas, 10,000 to 12,000 cu. ft. (measured at 60° F. and 30 in. pressure); tar, 8 to 12 gal.; and ammonia, as ammonium sulphate, 20 to 24 lbs.



The Turner Special School in Which Three Open-Air Rooms Were Provided and Which Had to Be Heated to Be Used

The Mechanical Ventilation of the St. Louis Schools

AN ENGINEERING STUDY

By Edwin S. Hallett

Chief Engineer, St. Louis Board of Education.

Part IV

THE great majority of the American people lay much stress upon the life in the open air, but most of them do not go farther in their thought about it than to open the window at night or move out to the sleeping porch. This action is the result of quite a general recommendation from health authorities, and is followed literally rather than intelligently. Some physician discovered many years ago that tubercular or anaemic patients who went out to the western and southwestern States, recovered health and some came back to live. Others came back and died.

It was the life in the open, with rest and nutrition that did it. Later there came a time when the stay at such health camps did not produce the results and many lost confidence in the use of such camps and recommended open air at home where the care and food could be better supplied. This move spread to the recommendation of fresh air for all the people.

It is believed that the correct version of this open-air cure has not been published. The writer has visited many of these western and southwestern cities that were formerly popular with tubercular patients, but are not now considered favorable places for recovery. The only explanation of this changed condition is that as the population filled in and made cities of camps, such cities became exactly like those back in the States from which the patient came and no advantage was secured by going away.

The open plains and mountains do yet have a very striking effect upon the health, but errors have been made in assigning causes for such improvement. Some have imagined that a high altitude of the mountains was good, and others that the dry desert air was beneficial. The truth is that neither of these departures from normal is beneficial, but rather injurious.

The presence of sunshine and the absence of dense population were and are the great factors in producing outdoor air at the best. The fact that carcasses of animals lay for months on the plains without decay in those early days, whereas now they decay as they do in Missouri, is evidence that some antiseptic agency was present in the air then and has now disappeared.

It also explains the fact that anaemic persons then gained in weight rapidly whereas they do not respond to diet and open air in those same places at present.

The simple explanation is this, that ozone is pro-

duced by the violet rays of the sun in a clear atmosphere and that a slight cloudiness from smoke and dust prevents it, as we well know such rays are prevented by slight turbidity of water and by ordinary window glass. Another reason for the absence of ozone in the populous community is that it is chemically active and in very small quantities and is quickly absorbed by sewage and the like.

REPRODUCING THE PRIMITIVE AIR CONDITIONS

Every fact bearing upon the recovery of health in the West bears out the fact that the ozone of the open country was responsible for the recovery when taken, of course, with suitable diet and rest. This leads to the conclusion that we must now reproduce those early conditions of health at home in our great cities.

THE OPEN-AIR SCHOOLS

The open-air school for the pale and undernourished, but not tubercular, dates back about fifteen years. These schools consist of one-story rooms, with south exposure and with all casement windows from ceiling to the floor the full length of the room. A warm room and teachers' room and lockers form a section between two class-rooms. No heat was supplied to the rooms, but steam pipes ran under the floor and the floor is not warm. An administration building, which was formerly a large residence, is equipped with dining room and kitchen, as well as clinic and drug rooms. Nurses' quarters are on the second floor.

The Taussig School, in St. Louis, has six class-rooms and accommodates about 175 children. Those children come from a large part of the city and carfare is furnished by a fund raised for the purpose. The children come every day except Sunday and eat one meal each day at the school, for which the parents pay actual cost, if they are able to pay; otherwise, the money is raised by outside means as a charity.

THE SCHOOL ROUTINE

The first duty is breakfast and then to dress for the schoolroom by putting on extra heavy over-clothing and long felt boots and hooded caps. Then some lessons, after which the furniture is moved to the side, cots are spread and all lie down for a nap. Heavy blankets are spread over each one. Again some lessons and then comes the noon luncheon that is served in the central building in normal air temperature. This diet is planned for these children to correct their pale and thin condition.

The afternoon is a repetition of the forenoon. Any child that develops any disease is removed from this school privilege, as this must not be confused with a hospital or sanitarium. The city (not the board of education) does support a night and day camp or school for the early stage of tuberculosis, but the children do not go home for any meals.

OBSERVATIONS ON THIS EXPERIMENT

The children selected for this open-air school are designated by the physicians in their inspections of the various schools. When they have regained their normal weight they return to the home school again. Most of the children are returned after a varying period, usually only a few months. The writer has carefully watched the operation of this school and has some decided opinions that may assist others in that field.

The open-air feature of this school is an utter failure. The beneficial results have come from the food and rest features, rather than the open air. The school-rooms are always dusty and uncomfortable, although more sweeping and cleaning is done than in regular schools. In an hour after cleaning, the furniture is overspread with dust that has blown in through the open side.

Nothing is more absurd than to assert that the use of heavy over-clothing is superior to clean warm air for maintaining the body temperature. Added clothing prevents the normal functioning of the skin and that alone is a most common form of inducing illness. The dust that falls on a pupil's desk will, when moistened on a piece of copper roofing, eat pin holes through it, due to the sulphuric acid of the sulphur in the coal smoke.

In St. Louis the teachers themselves now have asked to have the temperature of the open-air rooms raised to about 60° F. The board has authorized the placing of a stove in each class-room so that the children and teachers may at least take

General View of the Taussig Open-Air School

turns at being warm. The theory that the outdoor air was better than the St. Louis ventilation systems has generally been exploded in popular opinion and there is no record of any instance where cold air was an advantage to the well or sick child.

ANOTHER FAD NAILED

A few years ago a new theory began to circulate that an open-air room or series of such rooms should be built into every grade school. This was supposed to be better than a concentrated open-air school. In yielding to this insistent suggestion the St. Louis Board of Education directed the construction of the new Turner School in which three such open-air rooms were to be provided. No heating ducts were

placed in the rooms, although the ducts were run to a point just back of the partition walls.

The attempt to have these rooms occupied has been a complete failure and the Commissioner of School Buildings has been directed to have these rooms heated and ventilated as are the other portions of the building. Time and again the classes attempted to use the cold rooms for recitations and had all the extra clothing and furniture, but the children refused to endure such hardships and moved into the warm corridors for their lessons. It clearly was demonstrated that a comfortable temperature was necessary for the performance of

Recitation Period at the Taussig Open-Air School

school work and it was equally conclusive that good health was not dependent upon suffering from cold.

A NEW TERM MUST BE INTRODUCED

The St. Louis Board of Education can be depended upon to carry out the recommendations of the specialists in building schools and R. M. Milligan, the architect and commissioner, is convinced that a new type of school should be built for this class of children. It ought to be called a school for anaemic children. The school should have facilities for giving proper food and special provision for rest and sleep in the most sanitary and permanent equipment.

The ventilation should be of the same type as that used in all the other recent schools. The temperature should be controlled to be comfortable with ordinary clothing. Pale, thin children are not able to endure the same temperatures that strictly normal children can stand. Low temperature presupposes vigorous activity and exercise, which is not prescribed for such children.

New Home Study Course in Gravity Steam and Water Heating

(*Continued from Page* 74.)

simple means for improving conditions. (b) The student is to consider that the system is to be remodeled so that the drop in pressure from the boiler to the end of the main will be considerably less than the present design allows.

Work Problem S-8-3

POOR STEAM DESIGN

Fig. S-8-4 shows a run of steam piping supplying two small radiators which are located fairly close to the boiler. When the system is in operation, water from the automatic air valve is thrown to the ceiling.

The student will explain (a) why water is thrown off in this manner and how to correct the trouble, (b) whether the layout could be improved by the use of fewer fittings, and if the design represents poor practice in the use of size of pipe or fittings, what should be done to improve without considerable change, (c) submit a pencil sketch showing a better and cheaper way to supply these two radiators.

Work Problem S-8-4

CHANGING ONE-PIPE STEAM HEATING SYSTEM TO A VAPOR PLANT

Many one-pipe steam heating systems have been remodeled into vapor systems through changing the radiator valves, installing radiator traps on the return side of the radiators and running the necessary return piping to an air eliminator or return trap.

Fig. S-8-5 shows a one-pipe steam heating system which is to be so remodeled using a return trap in a position approximately as shown. The student will indicate on this figure all necessary equipment, change of piping, and new piping. He will prepare this figure so that an estimate of material could be made therefrom by noting clearly all requirements.

Work Problem S-8-5

(To be Continued.)

Air Conditioning in the Radio Field

TO eliminate static and get perfect reception the year round, regardless of the season, climate or weather change, radio makers have called in the air-conditioning engineer, who has installed in their research laboratories "made-to-order" weather so that research workers may now conduct their tests under any atmospheric conditions wanted.

An important innovation in radio, too, is the introduction of electrically-controlled air within the broadcasting room. These rooms or studios are usually enclosed in plate glass for visitors to look through and are air-tight to be sound-proof. Therefore, they must be ventilated with a supply of clean fresh air for the performers within. Usually, blowers are connected on the outside to the studio in such a way that fresh air can be obtained without lessening the broadcasting efficiency of the room.

True Vapor-Heating Defined

An Outline of the Characteristics Which Distinguish Vapor from All Other Systems

A GREAT difference of opinion seems to exist in the minds of those connected with the heating industry as to just what constitutes vapor heating and what does not. At first glance it would seem to be not at all difficult to classify modern heating systems, each in its proper category and beyond any argument or dispute.

However, such is not the case. The explanation as to the why and the wherefore of this condition will be better appreciated, perhaps, by a glance through some of the questions arising when such segregation is attempted.

For instance, is vapor heating determined by the arrangement of the piping in the system? It takes a little thought along this line before we are ready to answer positively, "No," and perhaps some readers will not agree with this conclusion until they stop to consider that vacuum systems employ the same piping scheme and only, in a few cases even, vary the size of pipe. Now vacuum systems were in use and widely known long before vapor was even thought of.

So, if it is not the piping arrangement, perhaps the difference may lay in the type of radiation used. Yet there will be less difficulty in answering this than there was in connection with the first proposition; we all know that water-type radiation is not only used for all water-heating systems but on many steam systems of various types as well. So this certainly cannot be taken as indicating anything definite as far as the kind of system is concerned.

Well, if it isn't the radiators or the piping, perhaps the use of graduated radiator inlet valves and thermostatic or float traps on the return might help out. But here, again, a difficulty is encountered in the fact that not only do most all vacuum systems employ the same valves, but the use of such valves is not obligatory on vapor systems; at least, a goodly number will operate without such equipment, especially as far as the graduated valves are concerned.

Consequently, neither the graduated valve nor the radiator trap can serve as a positive and absolute identification of a vapor system.

Surely it cannot be the boiler! We all know that practically all makes of boilers are used indiscriminately with vapor systems and give satisfaction. So it is not the boiler.

Now, if all the facts cited in the foregoing are correct, it leads naturally to the conclusion that the installation and arrangement do not necessarily determine whether a steam system is a vapor system or not. Outside of a few minor items, such as smoke-pipe, boiler trimmings, covering, and so on, the piping, radiators, radiator valves and boiler constitute all there is of a heating system; if these lead to nothing, as far as classification goes, it may be accepted that help must be looked for in some other direction.

About the only thing left is the method of operation, combined with the pressure used in operating. Is the vapor system operated on a different basis from all others? And, if so, how?

All true vapor systems *normally* operate on a slight vacuum which is self-induced, without the aid of any power-driven mechanical apparatus. It is true there may be times when vapor produces a positive pressure either slight (such as when expelling air from the system) or pronounced (as when extreme weather is experienced for a few days each winter). Yet, in spite of all the different pressures which may exist from time to time for brief periods, the NORMAL condition of pressure is at, or slightly *below* atmospheric pressure.

Moreover the zero, or small negative pressure, exists on both the steam and return line and is fairly constant throughout the system; this is due to the fact that a partial vacuum is being produced by the condensation of steam, or vapor, in the radiators themselves, from which point the reduction in pressure penetrates to every part of the system, even including the boiler.

As the only other steam heating system which operates at a vacuum is the well-known "vacuum system" employing a vacuum pump which is power-operated, there will be no conflict in designation between these two systems.

But what is going to be done about the so-called vapor-vacuum and vacuum-vapor systems? These systems are trying to straddle both sides of the fence, which is always a difficult proposition at any time. Each is trying to tell the purchaser who favors various vacuum systems, that it *is* a vacuum system, and the purchaser who likes a vapor system, that it *is* a vapor system.

If these combinations of vacuum and vapor have a vacuum produced by a power-driven apparatus, they are vacuum systems, pure and simple. But, if these systems produce their vacuum by internal condensation, they are simply vapor systems.

The atmospheric system very closely parallels those just discussed. In this system the returns are open to the atmosphere, hence its name. There is never any negative or positive pressure on the return and the condensation flows back to the boiler (or is wasted) the same as water flows through a waste line. On the steam line a positive pressure is always carried, and a partial vacuum cannot be formed by the condensation of steam in the radiators since any such vacuum is prevented by the fact that air may enter the system through the return, which is always open to the atmosphere.

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IT has been more or less of a puzzle to the ventilating world to see so little attention paid by the open-window ventilation advocates to the extensive investigations in connection with ventilation and the "comfort zone," carried out at the A.S.H. & V.E. Research Laboratory, in Pittsburgh. For instance, in Dr. Thomas R. Wood's and Ethel M. Hendriksen's new book on "Ventilation and Health," which, it is noted, is devoted to "the new hygiene of fresh air," they state in their preface that "so far as is known, no university or medical school conducts research work in ventilation, although work of this nature has been undertaken by the United States Bureau of Mines, devoted almost wholly to industry." This is the nearest they come to mentioning the A.S.H. & V.E. Research Laboratory.

Further along, however, the mystery is explained. After characterizing Leonard Hill, of London, as "the first experimenter to define fresh air," they make this significant statement: "Hill pointed out to one of the authors that 'comfort opinions' in regard to room air are unreliable, because the human skin is not stimulated by a monotonous air condition." They then quote Leonard Hill as recommending a study of pulse frequency as a method of determining whether a room is overheated.

Thus, at one fell swoop are the Research Laboratory's "effective temperature" tests brought to naught and the basis of the "comfort zone" rocked to its foundations!

EVER since air cooling became an important factor in the work of the heating and ventilating engineer, the vital data on this subject have been held rather closely by the comparatively few whose experience has given them inside knowledge of the practical requirements and possibilities. Frequently the remark is made that a given article on air cooling leaves the reader up the proverbial "salt creek" as to what he really wants to know. With the recent rapid growth in the application of refrigerating equipment to the cooling of theaters, there has been an insistent demand for data on the subject and it is a matter for gratification to us that we are now able to meet this demand.

In the article in the present issue on theater cooling, the author draws on his own wide experience covering the design of cooling equipment for various types of theatre buildings, including some of the most important in the country. He presents not only the essential data which he has found most satisfactory, but takes the reader step by step through the necessary preliminary calculations and thence through the actual design.

DUE to a condition existing in the earlier days of the oil-burner industry, THE HEATING AND VENTILATING MAGAZINE suggested and secured the acceptance, by the leading oil-burner interests, of the following code relating to their advertising copy and other sales literature:

(a) The elimination of superlatives.
(b) The elimination of comparative statements.
(c) The elimination of statements of alleged facts, unless they can readily be proven.

While the enthusiasm of copy-writers occasionally has led them to overstep the code, the general adherence of the oil-burner industry to its spirit and purpose constitutes a remarkable tribute to their sincerity and good sportsmanship.

With the adjustment, however, of this situation, it soon became apparent that the code properly applied to all manufacturers represented in the advertising columns. It is a gratifying fact that, for the most part, the heating and ventilating industry has passed beyond the stage of invidious comparison and extravagant statement and we bespeak their interest and co-operation in maintaining this happy condition.

One of the leading radio broadcasting stations in the East, operated by a large department store, winds up its program each night with the statement that it is being sent out by such-and-such a company, "one of America's great stores." How much more resounding and impressive is such a slogan than the kind we hear so often with superlative bombast as its dominant note.

The Largest Low-Pressure Cast-Iron Boiler Installation in the World

Operating Data for the Alden Park Manor Buildings in Detroit, Brookline and Germantown, Burning 19-Degree Fuel-Oil

THE largest group of apartment houses in the United States, heated with oil, is owned by Alden Park Manors, Inc. The first group of buildings was erected in Detroit, Mich., and consists of four large apartment buildings, located 160 ft. apart, each containing 88 apartments, making 352 apartments in all. In addition there are various shops and offices which also must be heated and supplied constantly with hot water, the total being equivalent to 370 apartments or 1500 rooms.

These buildings are heated from one boiler room, located in one of the two central buildings of the group. The total radiation load is 87,000 sq. ft. of equivalent direct radiation, and five 30-sec. Utica - Imperial Super - Smokeless cast-iron boilers supply the heat to all four buildings. These boilers are 23 ft. long, and it is probable that this is one of the largest installations of low-pressure, cast-iron boilers in the country.

Each of these boilers is equipped with Simplex improved turbine burners, with the air and oil mechanically interlocked. The ten burners are driven by two No. 28 Simplex pump and fan units, with a duplicate spare unit.

COMPARATIVE COST DATA ON COAL AND OIL

There has been much discussion as to whether or not oil burning is more or less expensive than coal, when attention to the boilers, removal of ashes and other operating expenses are figured. Detroit happens to be one of the worst cities for oil in a price comparison. Soft coal can be purchased for from $5.00 to $6.00 a ton delivered, whereas fuel-oil, zero cold test, 19° Baumé, comes to between 8 and 8½ cents per gallon, where the storage is over 5,000 gal.

Coal is generally figured around Detroit on the basis of 37 tons of soft coal per 1,000 sq. ft. of radiation per season, amounting to $222.00, while oil is figured at 5,000 gal. for the same amount of radiation per season, totaling $425.00.

There is, of course, a large saving in operating expense to be figured against this difference, which includes the elimination of handling ashes, maintenance of furnace grates and linings, and smaller expense for apartment renovating. In the Alden Park Manor, Detroit, after four years of operation, J. T. Kelly, the chief engineer, states that about $36.00 has been spent on repairs for the ten burners. He estimates that the saving in firing, ash handling and coal handling alone amounts to $10,000 a year. According to him, the complete system does not require over 30 minutes' attention a day.

The Kenilworth Apartments, the Latest Park Manor Group, in Germantown, Pa.

OIL CONSUMPTION CLOSE TO ESTIMATED RANGE

The oil consumption for both the main heating plant and the service water heater has been figured by Dale O. Miller, secretary and treasurer of Mechanical Heat & Cold, Inc., at an average of about 5 gal. per square foot of radiation per season. He states *that this is about the average consumption for apartments in this locality, although it will run as low as 3 gal. per square foot per season in an office building or school, with an 8 or 9-hour heating period, and as low as 1½ gal. in a church.

SUCCESS OF INSTALLATION BORNE OUT BY DUPLICATION OF EQUIPMENT IN OTHER GROUPS

That the owners of Alden Park Manors, Inc., are satisfied with the results which they have obtained in their Detroit group of buildings is demonstrated by the fact that they have duplicated the equipment in two additional groups of buildings, one at Brookline, Mass., and the other at Germantown, Philadelphia, Pa. They are also installing a similar heating plant in still a fourth group now under construction at Germantown.

In an article in *The Apartment House News*, written by H. J. Hager, general manager, Alden Park Manor, and J. T. Kelly, mechanical superintendent, it is stated that they are proud of the heating plant from the point of view of both satisfaction and economy. The buildings are located on the Detroit River, and Mr. Hager says that he knows of no other buildings which have such an exposure to wind and cold during the heating season.

SOME OF STEAM LINES EXTEND 750 FT.

Part of the heating system is over 750 ft. from the boiler room, yet steady and constant heat is provided at all times without any trouble in regulation. The heat is manually controlled because the steam pressure is not great enough to make an appreciable difference on an automatic control. The average pressure on the boilers is about 4 oz.

The installation operates without smoke or soot, and the boilers are cleaned once a year. The average evaporation is over 10 lbs. of water per pound of oil consumed, in spite of the fact that heat must be sent to such a distance from the boiler room and with such a low pressure as 4 oz. at the boiler.

ARRANGEMENT OF OIL SUPPLY

A very heavy fuel-oil is used, which is pumped to the burners under a 20-lb. pressure. The oil-storage tanks are

Fuel Oil, April, 1926.

The Original Alden Park Manor Group in Detroit, Mich.

buried in the ground about 30 ft. from the boilers, and have a storage capacity of 40,000 gal. While the cost of oil as fuel may be higher than coal, Mr. Hager figures that they are far ahead in the saving in the cost of labor, the absence of smoke soot, coal dust and ashes. One engineer looks after the heating plant, refrigeration system and all the pumps necessary for a building of this size. They figure the actual fuel cost for an apartment for one year is $86.98 for heat and hot water.

The Alden Park Manor Group in Germantown, Pa.

THE BROOKLINE GROUP

The Alden Park Manor, Brookline, Mass., is located in the Longwood section, at Longwood Avenue and Chapel Street, and is the second largest group of apartment buildings in the world—second only to the Alden Park Manors at Detroit. The cost of the group has been estimated at approximately $5,000,000. It consists of three eight-story buildings, fireproof, in the shape of a cross, insuring light to every room in the buildings. It is located in the center of a four-and-a-half acre park, overlooking the Fenway, and is 100% co-operative.

The buildings were designed by Harold Field Kellogg, architect, of Boston, and were built by Kenneth M. deVos & Company, who were also architects and builders for the first group in Detroit. The heating plant in each of these buildings was installed by John G. Westphal. In the three buildings there are 1100 rooms, housing 800 persons. Every possible feature for the comfort of the tenants has been introduced. All kitchen cabinet work is of steel and vermin-proof, and each kitchen is provided with mechanical refrigeration. An incinerator is provided for each suite. All groceries and parcels are delivered underground, brought up in service elevators to the proper floor and delivered through service doors from the halls to the kitchen.

A large ballroom, which will accommodate several hundred persons, is at the disposal of tenants. Meals are served in the large dining room or in the private apartment, or the tenants may cook their own meals. Other features, such as indoor golf course, clock golf on the lawn in summer, a squash court and playrooms for children, are provided for the convenience of tenants. All mechanical equipment is in duplicate so that in case of accident it may be repaired or replaced without loss of time or inconvenience to the tenants.

Typical Installation of Oil-Fired Cast-Iron Sectional Boilers in Alden Park Manor Building Groups

THE GERMANTOWN GROUP

The Alden Park Manor, Germantown, Philadelphia, consists of one group of three buildings, containing 271 apartments, ranging in size from three rooms and one bath to ten rooms and five baths, and a newer group of two buildings on the same property known as "The Kenilworth" Apartments, containing 89 apartments—making a total of 360 apartments. These buildings are located on a 26½-acre tract of ground, with a golf course on the premises.

There is a swimming pool arranged for all-year-round use, and a 300-car garage, both of which are heated from the central heating plant in the main building. One S-4015 Super-Smokeless boiler takes care of the hot water tax of two 2050-gal. tanks in the Alden Park Manor and one S-4012 takes care of a 3000-gal. tank in the Kenilworth. Both buildings are located on the same property and are under the same control and operation.

Special features in all of these buildings include cork flooring throughout, except in kitchens and bath rooms, waxed finished and cemented to concrete. All bath rooms are equipped with showers, built-in tubs, china pedestal lavatory, steel enamel medicine cabinet, plate-glass mirror and shelves. The glass holder, electric light fixtures, soap dishes and towel bars are of selected china and are set in the walls.

In conjunction with each group of buildings is a garage for the convenience of tenants. These garages will hold from 250 to 300 cars, and are also heated with Utica-Imperial Super-Smokeless boilers equipped with Simplex burners.

The Alden Park Manor Group in Brookline, Mass.

TOTAL RADIATION LOAD FOR FOUR GROUPS 350,000 SQ. FT.

The total radiation load for the four groups of buildings and their garages amounts to approximately 350,000 sq. ft. of equivalent direct radiation. These buildings are heated by sixteen 30-section boilers, one 20-section, one 15-section, one 12-section and one 10-section boiler, totaling 537 sections in all, and having a total combined rating of 386,750 sq. ft. of radiation.

Because of the policy of providing duplicate mechanical equipment, however, several of these boilers have never been operated. In the Detroit group, for instance, only four of the five boilers have ever been used and only three of the five are normally used, except in extremely cold weather.

Not only are the Alden Park Manors, Inc., the largest group of apartment buildings in the world, but the boilers are probably the largest installation of low-pressure cast-iron boilers in existence.

The New "National Sheet Metal Contractor"

The *National Sheet Metal Contractor* for December appears in a new and revised form. Considerably enlarged and with a very attractive cover design, the issue is a great improvement over the old *National Sheet Metal Contractor*. This journal is the official organ of the National Association of Sheet-Metal Contractors.

1927 to Be Another Big Building Year

NINETEEN twenty-seven is going to be another big building year, according to the annual survey carried out by *The Architectural Forum* of New York. Nineteen twenty-six, however, was such a peak year that it would be altogether too sanguine to expect nineteen twenty-seven to exceed or even equal it. Probably the coming year will be about 12½% less than the banner year of 1926.

The method of survey of the probable construction to be carried out in 1927 consists of obtaining a myriad of confidential reports from all sources. Over 2000 such reports are obtained and digested. A series of ratios is applied to the results, the correctness of which ratios have been borne out by results of former years.

The survey shows that in all probability 1927 will be a six billion dollar year, as compared with a seven billion dollar year in 1926.

For those who wish to review and compare building activity since 1915, there is shown herewith a classification chart recording monthly totals of plans filed, contracts let and the volume of new business, as measured in cubic footage. These figures are based primarily on reports of the F. W. Dodge Corporation. There is shown also an index of building cost which offers an interesting comparison with the activity during any period of the past.

In order that some detailed measure may be had of anticipated building activity during the year 1927, the architects' reports received by *The Architectural Forum* have been correlated and weighed for presentation in the accompanying table, which gives the expected activity in nineteen types of buildings, allocated to six divisions of the country. This tabulation shows a total of $4,856,817,500, which, it is believed, represents the approximate value of the new construction which will be planned and executed in 1927 through architects. In addition to this, there will be several hundred million dollars expended for small residences in rural districts. These buildings, together with a large volume of industrial building and a considerable program of remodeling, do not come within the architect's scope of service. A part of this is handled by the architect but which is not recorded in this table. In total, therefore, the forecast for 1927 exceeds six billion dollars.

It is quite probable that a considerable part of the decrease in building activity in 1927 as compared to 1926 will be found in the cutting down of cheap speculative building. From important mortgage-money sources it is learned that the constantly-growing tendency is to discourage flimsy construction, and the supervision of specifications has been developed to a considerable degree of efficiency, as compared to the poor methods of control exercised in past years.

Expected Activity in Nineteen Types of Buildings During 1927

BUILDING TYPES	N. EASTERN STATES	N. ATLANTIC STATES	S. EASTERN STATES	S. WESTERN STATES	MIDDLE STATES	WESTERN STATES	U.S.A.
Automotive	$8,605,000	$37,070,000	$8,887.500	$8,735,000	$52,365,000	$21,470,000	$137,132,500
Banks	16,000,000	81,425,000	4,485,000	6,700,000	41,050,000	8,997,500	158,657,500
Apartments	21,757,500	331,602,500	14,500,000	25,317,500	157,047,500	57,775,000	608,000,000
Apartment Hotels	6,337,500	117,362,500	5,562,500	5,675,000	48,150,000	25,150,000	208,237,500
Clubs Fraternal, etc.	11,882,500	62,362,500	9,687,500	12,395,000	73,667,500	37,845,000	207,840,000
Community and Memorial	4,337,500	29,570,000	1,112,500	18,815,000	31,275,000	11,522,500	96,632,500
Churches	39,345,000	99,840,000	12,937,500	35,402,500	90,960,000	36,415,000	314,900,000
Dwellings (Under $10,000)	8,555,000	40,607,500	7,925,000	12,990,000	31,867,500	13,875,000	115,820,000
Dwellings ($10,000 to $50,000)	7,925,000	39,687,500	6,095,000	11,940,000	38,737,500	12,095,000	116,480,000
Dwellings (Over $50,000)	8,075,000	33,520,000	2,212,500	5,915,000	29,220,000	11,387,500	90,330,000
Hotels	20,970,000	92,442,500	25,762,500	37,725,000	92,950,000	66,917,500	336,767,500
Hospitals	17,850,000	126,937,500	7,850,000	18,465,000	78,222,500	23,622,500	272,947,500
†Industrial	42,362,500	134,205,000	2,415,000	18,555,000	139,455,000	17,797,500	354,790,000
Office Buildings	32,250,000	194,140,000	7,757,500	47,385,000	267,845,000	68,250,000	617,627,500
Public Buildings	28,102,500	102,027,500	6,950,000	10,912,500	65,845,000	56,440,000	270,277,500
Schools	52,900,000	144,950,000	24,770,000	43,325,000	219,080,000	81,215,000	566,240,000
Stores	5,417,500	42,025,000	14,072,500	7,567,500	25,487,500	12,497,500	107,067,500
Theaters	18,637,500	54,747,500	6,995,000	11,012,500	93,367,500	14,892,500	199,652,500
Welfare Y.M.C.A., etc.	7,425,000	24,167,500	4,262,500	4,745,000	30,537,500	6,280,000	77,417,500
TOTAL VALUE OF NEW BUILDINGS	$358,735,000	$1,788,690,000	$174,240,000	$343,577,500	$1,607,130,000	$584,445,000	$4,856,817,500

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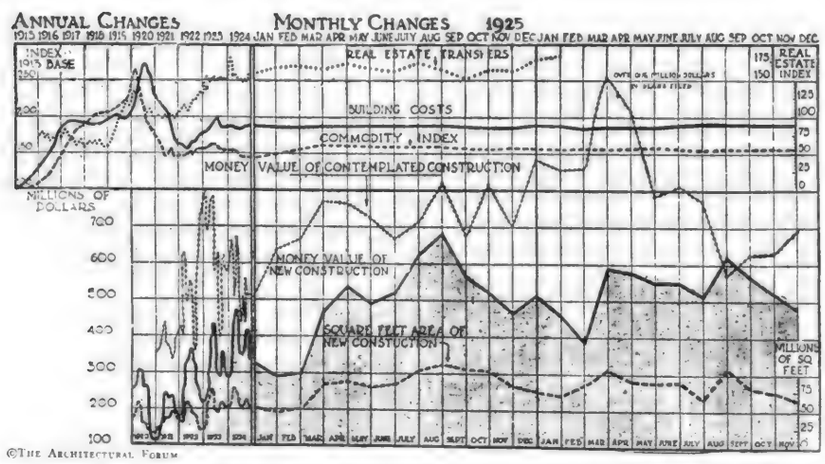

Monthly Totals of Plans Filed, Contracts Let, and Volume of New Business Since 1915

Department of Commerce Issues Primer of Simplified Practice

Some idea of the extent to which simplified practice is being applied, to eliminate avoidable industrial waste growing out of the production of needless styles, types and sizes of commonplace articles, is given in a primer of simplified practice which has just been made public by the Department of Commerce in Washington.

The history of the simplification movement is a record of constant abandonment of the fallacy that widely diverse or "odd sizes" tends to secure competitive advantages. The passing of this misconception had led to a point where to-day industries as a whole are very generally competing with other industries through simplification to broaden markets and induce the widest possible consumption of their respective products, the primer says.

Estimates of savings in money by some of the industries now producing on the simplified practice plan recorded in the primer are paving brick, $1,000,000; sheet steel, $2,400,000; steel reinforcing bars, $4,500,000; warehouse forms, $5,000,000; range boilers, $5,500,000; inquiry, purchase, order, and invoice forms, $15,000,000; and lumber $200,000,000.

A movement for simplified practice may be initiated as a result of a request by anyone concerned, indicating a need and desire for development of a simplification program. Other than those in the industry, its distributors or consumers, suggestions may come from chambers of commerce, trade associations, technical bodies, and others.

Sufficient interest having been indicated in the movement by the industry, the co-operation of trade associations and manufacturers is sought to make a survey of production, the variety, and demand, the results of which are later placed before a general conference of manufacturers, wholesalers, retailers and consumers for consideration.

Under the procedure of the Division of Simplified Practice, each simplified practice recommendation must be accepted by producers, distributors, and consumers representing 80% of the annual volume of the industry, it being believed that only such a proportion of acceptance will insure general application and adoption.

The Division of Simplified Practice has no police power to enforce simplified recommendations nor does it desire any. The government offers its services merely as an effective agency in bringing together business groups on a neutral ground. The final recommendations as to the elimination of sizes, styles, and types of articles is the job of the industry itself and the adherence to such recommendations is left entirely to the business group interested.

A representative standing committee is appointed at the general conference to serve as a liasion between the Department and the industry, and upon whom devolves the duties of promoting, encouraging and supporting the findings of the conferees, as well as conducting annual resurveys to ascertain the degree of adherence and convene to effect revisions, or reaffirmations.

In addition to the simplified practice recommendations now in effect, including some 60 products, those in process of acceptance include hollow building tile, wrought-iron and steel pipe, valves and pipe fittings, sizes of valves and fittings and sizes of pipe. Sizes of valves and fittings are being reduced from 20,000 to 19,238 and sizes of pipe from 62 to 49.

STUDY OF SALT LAKE CITY SMOKE PROBLEMS is the title of Bulletin No. 254, recently issued by the Bureau of Mines, Department of Commerce, Washington, D. C. This bulletin contains an account of the campaign undertaken by the civic authorities in co-operation with the University of Utah and the Bureau of Mines, whereby the production of smoke in the industrial and business districts of the city was reduced 95% in the short period of five years.

RULES FOR BURNING COAL IN SMALL DOMESTIC FURNACES is the designation of Circular No. 9, issued by the Engineering Extension Department of Purdue University, Lafayette, Ind. This bulletin contains four short sections, the first being entitled, "Preparation of Equipment for Any Kind of Coal," the second, "Management of Furnace for Bituminous (Soft) Coal," the third, "Rules for Burning Coke with Small Size Anthracite," and the last, "Suggestions for Burning Indiana Coals." Size 6 in. x 9 in. Pp. 7.

British Smoke Abatement League Recommends Extending Clean-Air Week

In the seventh annual report recently issued in England by the Smoke Abatement League of Great Britain, there is emphasized the importance of organizing clean-air weeks, so as to have at least one clean-air week a year in every locality.

While the intention of the clean-air weeks is, at present, purely for education, it is thought that ultimately they may develop into clean-air campaigns against the smoke nuisance.

Chicago's Power Show

Heating and ventilating manufacturers were prominent among the exhibitors at the Chicago Power Show, held February 15-19 at the Coliseum. This show is officially known as the Midwestern Engineering and Power Exposition. The exhibitors included:

Alexander Bros.
American Blower Company
American Steam Pump Company
American Schaeffer & Budenberg Corporation
Armstrong Machine Works
E. B. Badger & Sons Company
Bishop-Babcock Sales Company
Boylston Steam Specialty Company
Bristol Company
Buffalo Forge Company
Chicago Pump Company
Clarage Fan Company
Crane Company
G. M. Davis Regulator Company
C. A. Dunham Company
Foxboro Company, Inc.
O. E. Frank Heater and Engineering Company
Griscom-Russell Company
The Herman Nelson Corporation
Illinois Engineering Company
Jenkins Bros.
Kelly Valve Company
Kieley & Mueller, Inc.
Midwest Piping & Supply Company
Modine Mfg. Company
Nash Engineering Company
National Tube Company
Northern Equipment Company
Nuway Boiler & Engineering Company
Wm. Powell Company
Powers Regulator Company
Reed Air Filter Company
Ross Heater Company
Sarco Company, Inc.
"SC" Regulator Company
Skidmore Corporation
Stannard Power Equipment Company
Sturtevant Mfg. Company
Swartwout Company
Trane Company
Warren Webster & Company
Wright-Austin Company
Yeomans Bros. Company

National Tuberculosis Association Becomes "Uncontrolled Ventilation" Propagandist

IN issuing "The Principles of Healthful Ventilation," as No. 5 of its Technical Series, the National Tuberculosis Association has joined forces with Professor C.-E. A. Winslow in his nation-wide campaign against controlled ventilation for schools.

This booklet was written by Dr. Joseph Herzstein, who was secretary of the New York State Commission on Ventilation during the period of its active study, which dates as far back as 1914-17. A pasted-in foreword signed by Linsly R. Williams, managing director, National Tuberculosis Association, is typical of the confusion of mind that frequently marks the utterances of those joined in this propaganda. For instance:

"Nearly all of these methods of artificial ventilation depend upon the use of heated air which is forced into the rooms to be ventilated." And:

"This report (of the New York State Commission) showed that ventilation by the use of windows and natural gravity exhaust provided a system of ventilation better than that which resulted in the buildings *which were ventilated by heated air.*"

The italics are our own.

It hardly seems possible that the writer of this foreword does not appreciate the fact that the only schools that are "ventilated" by (through the sole action of) heated air are the so-called "open-window, gravity exhaust" types.

The presentation of the subject matter of the booklet savors strongly of a move to "sell" the report of the New York State Commission to the public, with the twists or interpretations of results emphasized in favor of the uncontrolled method of ventilation.

Under the caption: "The Physical Factors of the Air Environment as Related to the Heat-Loss Function," there are discussed the effects in changes of air temperature, humidity and air movement, yet no reference is made to the highly-scientific experimental work in the research laboratory at Pittsburgh, carried out, not by the American Society of Heating and Ventilating Engineers, but by that organization *jointly* with the U. S. Public Health Service and the U. S. Bureau of Mines. These investigators, who have conducted a monumental research work, are ignored, with the fruits of their labors. In fact, the comments in this present pamphlet relate to old studies and the benefits of more recent investigations are not considered.

It is disquieting to find a great national association putting out biased propaganda dealing with the subject of school ventilation without having had contact with or counsel from another national organization, composed largely of professional men whose life work and interest center on the problems of providing both heat and ventilation for those human beings who are obliged to live and labor in latitudes where buildings must be heated during the winter season.

Is it any less presumptuous for a doctor of medicine to tell the world the best methods of securing heat and proper ventilation in its schools than it would be for a heating engineer authoritatively to pronounce certain technique the best for the treatment of scarlet fever or diphtheria?

An indication of the thin ice upon which the "open window" theories are built is evidenced in the following statement, found at the bottom of page 25: "*'The gravity exhaust duct'* must be provided for successful window ventilation. There is no need for a suction fan in this duct. The fan works against the success of the system."

What explanation could properly be made to the fact that an architect who was associated in the design of the first school to incorporate these features, the Sherman School, at Fairfield, Conn., (mentioned on page 24 of the booklet) in his recent schools has put fans in his exhaust ducts, after his experience with the Sherman School? There is such a school, of his design, within a few blocks of the Sherman School, and another has just been designed to be built in Hartford. If this architect, who lives near the Sherman School, found it desirable to put fans in the exhaust ducts, and change them from "gravity exhaust ducts," with no control of the air passing through them, to ducts with mechanical and, therefore, controllable exhaust, what is the answer?

On the last page is the "kick"—the message. Referring to the law in force in the majority of northern States requiring the supply of 30 cu. ft. per minute per pupil, the booklet says, bluntly: "It should be repealed. . . . Every possible influence should be exerted to have *these statutes* revised."

There is little ground, in the light of present-day knowledge, to claim that the basis of these statutes is a correct one. It was correct, in the light of scientific knowledge when put upon the statute books. Yet it would be the lowest form of idiocy to remove an imperfect law *unless a better substitute can be offered.* And, so far, the proponents of uncontrolled ventilation have advanced no constructive thought along this line. But, as witness the resolution, railroaded through an unsuspecting American Public Health Association convention, and the cry of the writer of this booklet, sponsored by the National Tuberculosis Association, they have urged the repeal of these laws and the leaving of the ventilation of American schools to the whims of any local school boards that can be "sold" by pseudo-scientists or "engineers" with new schemes for balking the laws of nature without mechanical means.

Witness the system now being advocated in the Middle-west where the windows are to be opened top and bottom. Yet, if you please, the New York State Commission finds that the windows must *not* be opened at the top.

What could be more naive than the paragraph preceding the last of this booklet?

"The ventilation engineer will correctly state that he can provide any type of air condition which the sanitarian, physiologist, and physician may order. *If, however, this type of air condition can be secured by means of a simple system of modified window ventilation,* why resort to a fan system, which is more costly and elaborate, more likely to get out of order, and requires more supervision? *Window ventilating and gravity exhaust may be depended upon to provide excellent atmospheric conditions.*"

The italics in the above quotation are editorial. No one has yet demonstrated that, with the arrangement above mentioned, it is possible to obtain such a combination of temperature, humidity and air movement as results in an optimum atmospheric condition. This air conditioner is based on the requirements as determined in the research laboratory of the U. S. Bureau of Mines, by the best minds of this bureau, the U. S. Public Health Service and the experts of the American Society of Heating and Ventilating Engineers. These scientific bodies have developed the science of air conditioning to a point where the public flocks to the theatres that are equipped with mechanical means to attain the desired conditions.

Admittedly the "gravity exhaust duct" is more simple than the fan. So is the ox, as a means of transportation more simple than the motor car. The ox, where he may be found, is also cheaper than the tin Lizzie. The ox plods slowly along, with infrequent "gee" and "haw", keeping the road with a minimum supervision. No one yet contemplates the automobile as a machine that does not require constant supervision. Yet the ox has completely disappeared from our civilized roads.

WARM-AIR FURNACE HEATING, by Ara Marcus Daniels, is easily one of the most comprehensive technical publications that has appeared on the subject of warm-air furnace heating. The entire volume contains over 445 pages, is profusely illustrated and is provided with an index for ready reference.

Chapters are devoted to typical warm-air furnace systems, types of furnaces, details of furnace construction, heat losses, effect of air temperature and leader sizes. Oil burning, gas-fired furnaces, humidifying and combination sys-

tems are also among the subjects handled.

An entire chapter is devoted to fan-operated, or forced, warm-air heating and another chapter to heating hot water from various devices placed in the fire-pot. Chimneys and furnace ratings. together with insulating coverings, are discussed in detail. Bound in flexible red and gold cover. Size 6 in. x 9 in. Pp. 445. Published by *Sheet Metal Worker*, 45 West 45th St., New York, or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

THE ART OF HEATING BUILDINGS BY GRAVITY-FLOW HOT-WATER HEATING SYSTEMS, by Professor Frederick E. Giesecke, constituting a summary of a thesis submitted in partial fulfillment of the requirements for the degree of doctor of philosophy in engineering in the graduate school of the University of Illinois, 1924, has been published by Professor Giesecke. It is a manual of 66 pages and contains the results of the research work conducted by Professor Giesecke at the University of Texas on friction of water in pipes and fittings and the dissipation of heat by bare iron pipes and by cast-iron water radiators. The heat dissipation data on bare iron pipe and radiators are reprinted from THE HEATING AND VENTILATING MAGAZINE for November, 1925 and June, 1926.

These and other experiments are prefaced with a review of the origin and development of gravity-flow water heating systems in France, England and Germany. There is also a chapter on the theory of gravity circulation in which are presented Tredgold's views, Hood's explanation, Peclet's analysis and Rietschel's contribution. In this chapter Professor Giesecke takes up the special method devised by him for determining hot-water friction head. In this method the velocity of the circulation is kept constant while the temperature of the water is allowed to change gradually until that state is attained for which the total friction-head manometer shows a zero reading. For that state, the pressure-head calculated from the temperature difference of the water in the flow and return risers is equal to the friction-head for the particular velocity and for the particular average temperature of the water in the system at that time.

Based on the results of these tests, Professor Giesecke concluded that to design a gravity-flow system correctly, it is necessary to proportion the several radiator circuits so that the friction-head in every circuit will be equal to the pressure-head of the radiator when the flow of water through the radiator is such that the radiator is receiving the proper supply of heat. It follows that, in order to design a gravity-flow water heating system correctly, it is necessary to know the friction of water at various temperatures and velocities in the pipes and fittings used in forming the several radiator circuits.

Professor Giesecke goes at length into this subject, dealing with warm or hot water, flowing at the very low velocities common in gravity-flow water heating systems. An index gives a list of the principal publications on the subject from 1911 to date. Size 6 x 9 in. Pp. 66.

S. R. Lewis Becomes Dramatic Critic

A letter has been received from S. R. Lewis commenting upon the playlet "Opposing Viewpoints in the School Ventilation Controversy," so ably staged by Dr. George Truman Palmer at the last annual convention of The American Public Health Association (see HEATING AND VENTILATING MAGAZINE, January, 1927).

Mr. Lewis says: "Of course I am culpable for allowing the uncontrolled ventilation crowd to have even a picture that could be criticized. When I wrote the article a year ago, I had no idea that it would receive any special publicity and I did not design the featured, unfortunate illustration at all. Months later, the artist submitted a sketch to me for approval, which I gave after a mere glance, as I was really thinking of the Watt system in Evanston which requires windows open at the top without any deflectors. May I make the following comment on Mr. Palmer's first attempt as a playwright?

"Apparently Mr. Palmer looked at the picture and did not read the article, or having read the article, and unable to controvert the arguments therein, decided to attack the essential mistakes of the artist. The artist probably lives in Evanston, where conditions similar to those depicted actually exist (except that top-hung curtains tend to deflect the cold air even more positively in a downward direction). The artist may also have had in mind one of the many schoolrooms which have windows on more than one side, especially as he left a considerable blind space between the windows, and did not show the window heads on a line with the ceiling.

"The Mechanical Ventilation Advocate went the following day to a window-ventilated school building. He happened to enter a south-side room while the wind happened to be from the northeast. Several windows were open at the bottom, with glass deflectors. The corridor doors and transoms were also open. The teacher reported that the window ventilation scheme was in effect and that she admired it.

"The visitor sat down opposite an open window to observe conditions. Much to his surprise, he felt no cold draft but was reasonably comfortable. The radiator under the window behind its shield seemed to be shut off, as he could not feel any effect from it. Upon lighting a match and holding it near the window opening, much to his surprise, he found the air passing out. He thereupon conducted an investigation and found that air was passing out through all of the windows in the room. The air from the corridor, which had entered on the windward side, was passing out through the leeward windows. Not one of the alleged beneficial effects, due to entry of fresh unheated air directly from outside at the breathing line, was in evidence.

"Upon his return to his office, he wrote the Window-Gravity Advocate concerning one item of the remarks of the latter (page 1108, November Journal, A.P.H.A.), wherein criticism of the Detroit open-window test was made in that 'the rooms had a great excess of direct radiation, all on one thermostat.'

"The Mechanical-Ventilation Advocate understood that each Detroit room had a separate thermostat. He wished to know, in an ideal room a la the American Public Health Association, how the direct radiators could practically be controlled, in any event, with more than one thermostat, and whether, if more than one thermostat should be required, such additional equipment would not be unduly costly for investment and maintenance, as compared with the single classroom thermostat usually installed with mechanical ventilation?

"The Mechanical-Ventilation Advocate also suggested that very many of the complaints about ventilation, if not all of them, raised or heard of by the American Public Health Association came from schools like those of New York City, already equipped with direct radiators, while few complaints came from Chicago and St. Louis, for instance, where no radiators whatever are installed in any classrooms.

"The general complaint seems to be that the ventilating systems are not operated. This failure to operate the ventilating plants was natural, since the radiators would furnish the heat required.

"The Mechanical-Ventilation Advocate submitted the apparent truth that no more consistently would the window ventilation be operated, when accompanied by direct radiators, since the radiators would furnish the heat required.

"There are plenty of states where no compulsory ventilation laws exist for school houses. In every state, whether laws exist or not, permission easily can be obtained for construction and operation of experimental window-ventilated rooms in regular buildings. The laws do not have to be changed to do this.

"All the arguments in the world will fail to settle the matter. The Mechanical-Ventilation Advocate and the Window-Gravity Advocate are at heart pretty decent fellows, both seeking the truth.

"Why not build a lot of these window-ventilated buildings and get them into operation the country over, as soon as possible? Let them be so built as not to be difficult of conversion if the truth lies that way. Let all of us visit them and study them. If they are satisfactory, all of us will join and get the laws changed quickly."

Correspondence

How Pressure Drop Affects A Heating System Making Necessary the Use of Equalizers

By T. W. Reynolds

EDITOR HEATING AND VENTILATING MAGAZINE:

Can you tell me the significance of the equalizer other than the dripping of a steam header? In other words, how does it equalize? I cannot make up my mind on this question and a full explanation of the purpose of the equalizer will be much appreciated.

P. A. S.

IN order to understand more clearly the purpose and action of an equalizer, one must have full knowledge of what is meant by "pressure drop" and how it affects the heating system. It will then be comprehended more readily just when an equalizer, so-called, is only a drip and when it really *serves* as an equalizer in the true sense of the word; hence a few remarks concerning pressure drop will be first in order.

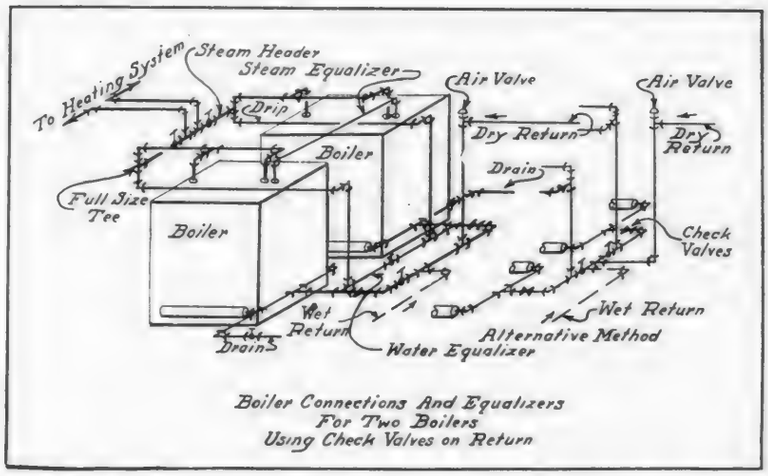

Fig. 2. Boiler Connections and Equalizers for Two Boilers, also Method of Interconnecting Boilers at their Return Ends with Check Valves

In any heating system there exists a certain differential in pressure between the pressure within the boiler and that in the ends of the system. This difference in pressure comes about, not only because of the steam condensing and leaving a void or vacuum, in other words, disappearing as steam and taking with it its characteristic condition of pressure, but also because of the friction opposing the flow of steam as it rubs over the inner surfaces of pipe and fittings. Energy or pressure must be given up by the steam in order to overcome this friction and produce a flow to the condensing points,—this energy is called the pressure drop.

As steam is generated in the boiler and increased to the pressure necessary for driving the air ahead, it pushes its way out to the radiating surfaces or points of lower pressure. Likewise, the pressure of the steam, acting downward on the water within the boiler, forces the water out of the return end of the boiler. This water rises in the return and produces a static head or pressure by virtue of its greater height. This pressure continues to increase until the additional weight of water column counterbalances the pressure drop or difference in pressure between the steam in the boiler and that in the return.

For example, if the steam pressure is 14 oz. within the boiler and only 4 oz. in the return, the pressure differential of 10 oz. will cause the water to back out of the boiler and rise in the return until its water level is *17 in. higher than the water-line in the boiler (see Fig. 1). If there is a check valve on the return it cannot back out, although it will hold the flap of the check valve shut until the above height of water column has accumulated from condensation back of the check, that is, the above height plus 3 in., more or less, of waterhead or pressure, as required to lift the flapper of the check valve to the open position.

When the system is heating up from cold, the radiators are condensing the steam faster than it is supplied to them. This excessive condensation together with the increase in friction, due to

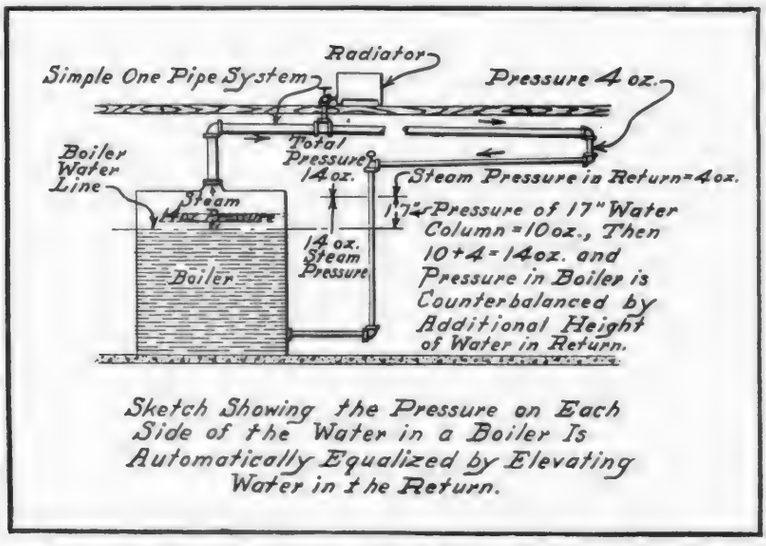
Simple One Pipe System
Radiator
Pressure 4 oz.
Boiler Water Line
Total Pressure 14 oz.
Steam Pressure in Return=4 oz.
Steam Max Pressure
Pressure of 17" Water Column=10 oz., Then 10+4=14 oz. and Pressure in Boiler is Counterbalanced by Additional Height of Water in Return.
14 oz. Steam Pressure
Boiler
Sketch Showing the Pressure on Each Side of the Water in a Boiler Is Automatically Equalized by Elevating Water in the Return.

Fig. 1. Diagram Showing How Difference in Water Pressure in Boiler is Equalized by Elevating Water in Return

*A column of water 27 in. high will produce a pressure at its base of 1 lb. or 16 oz. per square inch, hence 10/16 × 27 = 17 in.

greater weight of steam flowing, causes a maximum pressure-drop, hence greatest elevation of water in the returns. As this heating-up period takes a considerable length of time, there will be a large amount of water retained or held up in the system, water meanwhile leaving the boiler outlet by evaporation. This retention of water may lower the boiler water-line to the danger point and result in cracked boiler sections where overheated, unless the system is designed so as to minimize this condition.

SUBSTITUTING CHECK VALVES FOR EQUALIZERS TO PREVENT WATER FROM BACKING OUT OF THE BOILER

In order to prevent water from backing out of the boiler it is necessary to use some device, such as an equalizer or check valve, but as seen from the preceding example check valves add considerably to the friction, causing the water to stand much higher in the returns, especially so when they deteriorate, as with prolonged service. As the headroom available from boiler water line to overhead piping is usually quite limited, it is advisable to reduce the friction or pressure drop to the minimum,

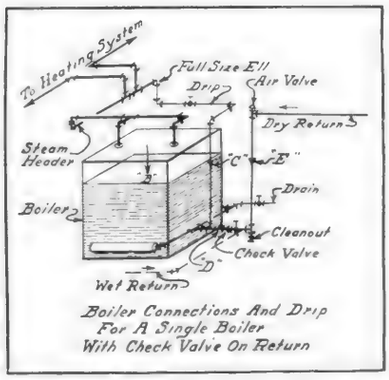

Fig. 3. Boiler Connections and Drip for a Single Boiler, with Check Valve on Return

otherwise the boiler may have to be set in a pit in order to prevent water from standing in the piping and radiators. For this reason check valves are sometimes used that require less lift, such as those having vertical hanging seats, instead of seats at 45 deg.

Quite often boilers are interconnected at their return ends with check valves as shown by the alternative method in Fig. 2. This method is not as good as the one shown at the left hand side of the sketch because of the equalizing pipes admitting boiler pressure to the system side of the check valves, thus causing the water on this side to back up in the system while it is heating up from cold, at which time the pressure differential is greatest. Again, it is practically impossible to find two check valves that offer the same resistance,—the several check valves will not operate simultaneously, hence an unsteady water line results. As the return pressure overcomes the resistance of one check valve, water will flow into the boiler to which it is connected and tend to prevent the other check valve from opening.

The use of check valves, as shown at the left hand side of the sketch, is not quite as objectionable. The main objection in this case is the fact that water will be held up back of these valves due to their resistance; also the fact that should the supply stop valve of one boiler be closed through error while the boiler is steaming the water would be driven from this boiler over to the other boiler with resultant damage. In long wet returns check valves add a feature of safety, especially where a leak or break might not be discovered, as in a buried pipe, but aside from this it would often be better if such a device had never been invented.

OBTAINING TRUE EQUALIZATION BY MEANS OF THE UNDERWRITERS' LOOP

The so-called "Underwriters' Loop,"—down to the floor and up again, then down once more,—overcomes the difficulties encountered in the use of check valves and offers several advantages, so much so that the arrangement has the approval of the steam boiler insurance companies. With such connections it is impossible to force water out through the return pipe below the point where the equalizer is connected; in fact the loop is a check valve in itself without its accompanying resistance and other disadvantages. If the stop valve on the steam outlet is closed through error and the safety valve inoperative the boiler will still be connected to the system through the loop, thus tending to keep the pressure within safe bounds. In such a case steam pressure would find relief through the return pipe and attention would then be directed to the trouble by the resultant action of water hammer.

The only objection to the loop is the human element,—the pipe fitter who fails to understand and makes an improper installation, for example, unless the top of the return header is slightly submerged steam will mix with the water in the header as the water line fluctuates. This would cause pounding or water hammer in the return header.

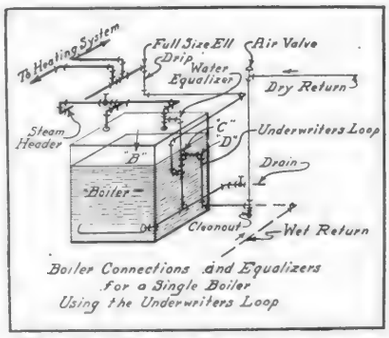

Fig. 4. Boiler Connections and Equalizers, for a Single Boiler, Using the Underwriters' Loop

WHEN AND HOW AN EQUALIZER REALLY EQUALIZES AND WHEN IT IS ONLY A DRIP

Referring to the sketches for the purpose of showing which are equalizers and which are drips, it will be seen that the line from the header in Fig. 3 is merely a drip and that it could only be an equalizer;—when eliminated as a drip; when made short and of ample area; and when connected at the water line to the return pipe "E", though in the case of the last requirement mentioned the arrangement as shown in Fig. 4 would be preferable to any other method of connection, such as the one at "E".

To make the point clearer this case may be likened to a U tube where equal pressure downward on the water in both sides of the tube, as at "B" and "C" in Fig. 3, would cause the water in both legs to remain at a uniform level unless the tube were connected at the bottom to a pipe, in which case the water would leave the tube and pass into the pipe, even as it would through pipe "D" in Fig. 3. However, in Fig. 3 the water is prevented from leaving the boiler by means of the check valve, hence there is no need of an equalizer, so long as the check is used. In Fig. 4 the conditions are different, though water is prevented from leaving the boiler, due to equal pressure applied to both sides,—"B" and "C" as before in the case of

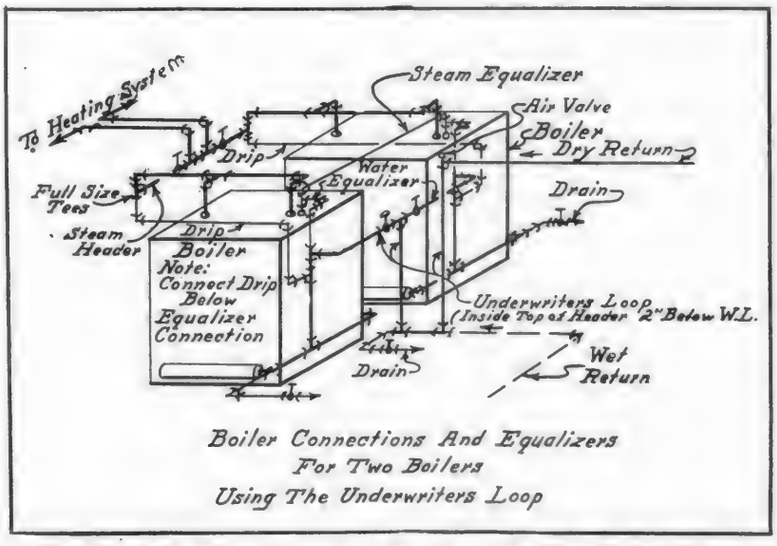

Fig. 5. Boiler Connections and Equalizers for Two Boilers Using the Underwriters' Loop

the U tube mentioned, yet the connecting pipe "D" in this case is above the bottom of the tube so that water could not be forced out through the pipe below the point where the equalizing connection ("C") is made.

Preventing water from backing out of a single boiler is not as important as it is to prevent it from backing out of one boiler into some other, as where two or more boilers are interconnected, because in the latter case there may be an appreciable difference in water lines of the two boilers, whereas in a single boiler the small volume of water rising in the return pipe cannot affect the elevation of the water line in the boiler to any great extent, due to the greater area of surface at the boiler water line.

In Fig. 5 there are two boilers, making the conditions slightly different than in the case of a single boiler. It is, of course, necessary to equalize the pressure on both sides of the water; that is, to communicate the steam pressure to the return side as before, but it is also necessary to cross connect the two boilers on each side of the water so as to establish the same pressure on both sides of each boiler, in view of the fact that it is difficult to fire two boilers so as to produce the same pressure in each.

These remarks also apply to the method as shown at the left hand side of Fig. 2, with the exception that the two drips do not prevent the water from leaving the boilers any more than the drip does in Fig. 3, such prevention being accomplished by means of the check valves. However, the steam equalizer balances the pressures on the steam side of the boilers while the water equalizer equalizes the pressure of the return water after passing through the checks, thus tending to equalize the flow to each boiler. This is not the case where check valves are used with connections made as shown by the alternative method in Fig. 2, in this case the varying resistances of the two checks causing an unequal flow to the two boilers.

The two boilers in Figs. 2 and 5 have been piped in duplicate so that either one will be independent of the other,—a unit in itself whenever the other is cut out. The drip pipes as shown are often called equalizers and though it is true that they do equalize to a certain extent, in fact, pressures in the two boilers tend to equalize through and by way of the steam header; yet this means cannot be depended upon. This is because the distance which the steam must travel, the number of fittings, and the fact that the great weight of steam flowing to the heating system is travelling the same route—all taken together gives rise to an appreciable amount of friction causing pressure drop, in this way preventing true pressure from reaching the points where equalization is desired.

It is very important that the friction in the equalizing connections be minimized by making the connections of ample area and as short as practicable. As few turns should be used as possible and all condensation and delivery of steam for heating should be eliminated from passing through the equalizers, separate piping being provided for this purpose. It is for these reasons that the equalizers as shown were separated from the drips and all connections to the header avoided.

In order to eliminate friction, in so far as possible it would be better to omit the use of all valves; but where two boilers are interconnected, valves become essential to operation, and in all cases where hydrostatic pressure tests are required, stop valves each side of each boiler must be installed. However, if used at all, they should be gate valves instead of globe valves, as gate valves offer less resistance to the flow of steam or water.

Flow Versus Return Connection For Expansion Tanks

EDITOR HEATING AND VENTILATING MAGAZINE:

The article entitled "Heating the American Home" as published in *Good Housekeeping* for March and written by P. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE, has been read by me with interest.

One of the diagrams accompanying this article shows the expansion tank connected to the flow (see "A", Fig. 1) just opposite to the arrangement in my home wherein the tank is connected to the return (see "B", Fig. 1). Does this interfere with the efficiency of my plant and could it be the reason why the temperature of the water never averages over 140° F., except when forced to the extreme?

I am inclined to think that it would and if this is true I believe that I have finally found the solution to a problem which has been the cause of my spending two miserable winters in this house.

CHARLES W. KECK.

Haddon Heights, N. J.

The only advantage of connecting the expansion tank to the return, in comparison with any connection from the flow pipe, is the slight economy which is obtained due to the saving of heat. Such economy in heat, in amount probably not appreciable, would be that obtained due to lessened evaporation out of the vent pipe, when connected to a tank containing the comparatively cool water of the return, plus the fact that only the cooler water of the return is wasted through the overflow whenever the water in the system boils over.

IMPORTANCE OF REMOVING AIR FROM SYSTEM

Of much greater importance is the freeing of the system from air in order to obtain positive circulation. For example, if the expansion tank is connected to the flow, it tends to vent the air out of the flow pipe, thus preventing it from entering the radiators and causing them to become air bound.

The best way of air venting the system is to extend the expansion pipe down to the basement and there connect it to the high point of the flow main, as shown at "C" in Fig. 1. Notwithstanding this fact, just for the mere sake of effecting a slight reduction in first cost, the connection is usually made to the nearest high point on the topmost floor, as at "A" or "B" in the sketch, especially in small residences. Such a method, in addition to the lessened tendency for good air elimination, has the further disadvantage that, unless the tank is placed at least 30 to 36 in. above the top of the highest radiator, air may enter the upper radiator by way of the expansion pipe whenever the water contracts and lowers below the point of connection. This may be overcome, however, by making the connection at a point well down the riser, although the best point of connection for catching the air is from the top of the riser.

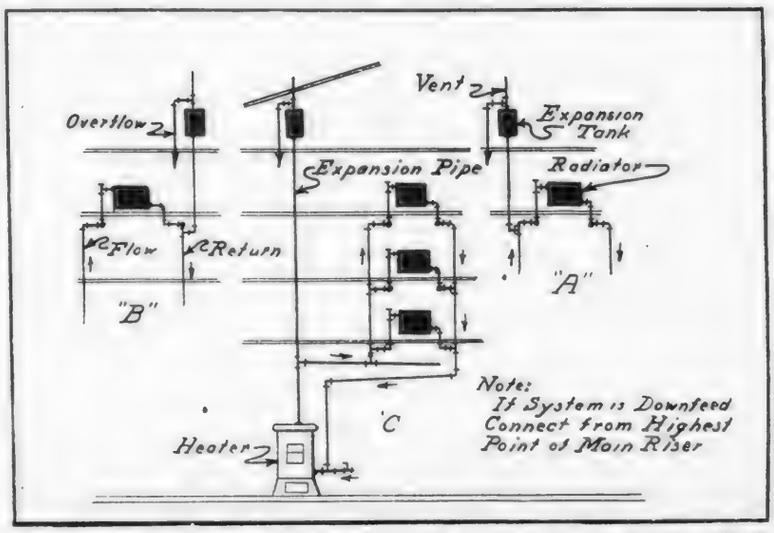

Fig. 1. Different Methods of Running Connections to Expansion Tank

Function of Expansion Tanks in Steam Heating System

EDITOR HEATING AND VENTILATING MAGAZINE:

In reading over various technical articles a question sometimes suggests itself to me, the answer for which is not contained in the article, and arouses speculation on my part as to the why and wherefore of some items described.

As an instance of what I mean, may I ask you to refer to the description of the heating and ventilating work as installed in the Palmer House, Chicago, which description was published in THE HEATING AND VENTILATING MAGAZINE for November, 1926. You will find therein a mention of the use of two expansion tanks on the steam mains in the attic. I would like to obtain further enlightenment on the advantage of such a device.

It would seem to me that, if an advantage is expected to be received on the basis of steam flow and saving of drop in pressure, the entrance and exit pressure drops, combined with the sudden changes in velocity, would be only a handicap.

The reduction in area would be as 1.5 sq. ft. (in the two 12-in. mains) would be to 13.5 sq. ft. (the area of the two 3-ft. tanks) or 1/9 the velocity obtaining in the main. On passing from the outlet of the tank into the continuation of the steam main, the velocity of the steam would be again increased back to its original amount. This sudden and large variation in areas would cause drop in pressure as compared with a straight pipe and constant velocity.

Steam at 5 lbs. gauge pressure has a density of about 0.05 per cubic foot and, at atmosphere, about 0.036 lbs. per cubic foot. The two tanks would have a capacity of

18×13.5 sq. ft., or 216 cu. ft.

and

$(0.05 - 0.036) \times 216 = 3$ lbs.,

change in weight of steam in both tanks, due to this variation in pressure.

A much greater capacity is included in the 300 ft. length of 18-in. steam main for this includes a cubical content of

1.68 sq. ft. $\times$ 300 or 504 cu. ft.

504 cu. ft. $\times 0.014 = 7.13$ lbs.,

change in weight of steam contained therein due to a reduction in pressure of 5 lbs. down to atmosphere.

Outside of the slowing up of the flow of steam and the separating of any entrained water, it is hard to see what other real function the two tanks perform. The actual storage, due to expansion, would not amount to much, while the sudden changes in velocity would undoubtedly introduce considerable pressure drop. An opinion on the theory of this practice would be appreciated.

Detroit, Mich. I. N. E.

EDITOR'S NOTE:—The author of the article on the Palmer House, in his description speaks of the "tanks whose function is to provide a reservoir of steam supply to take care of sudden fluctuations in the heating load." Our correspondent in his letter brings out the fact that the addition of such tanks would increase the cubical steam content, which ordinarily would be contained in the main only, by 3/7.13, or 42%.

Hands Across the Sea

EDITOR HEATING AND VENTILATING MAGAZINE:

In my mail I find a communication on the letterhead of the Osaka Ventilating Company, Osaka, Japan, signed by T. Kono, manager. The company operates in plumbing, heating and ventilating. I suppose others in the heating and ventilating industry have also received Brother Kono's message. Here is a copy of the letter, which is neatly typewritten.

"We humbly desire to pay our respects to the members of the H. & V. E. and take the liberty of introducing ourselves to you, as established in the line of trade same as yourselves. You will honor us if you will remember there are your fellows in the far corner of the world, on the other side of the Pacific, who are using their activities with the high ideal and the correct direction. It will be esteemed a great favor if your valuable co-operation is rendered toward the development of our trade in this country, as your assistance is ardently needed, and if opportunity presents itself we may promote our mutual benefits; or we shall be only glad to have a talk with you commercially or otherwise, and words from you will be highly esteemed. Soliciting your companionship, meanwhile, we remain,

The Osaka Ventilating Co.
T. Kono, manager."

Itachibori Bldg.
Osaka, Japan.

There is such a brotherly and gentle tone in that letter, it brought tears to my eyes. The spirit which prompted such a letter is above praise. I am certain all American plumbers, fitters and heating engineers will respond to the fraternal greeting of that letter. We would have no international disputes if all men were as T. Kono, of Osaka, Japan. I would ask that you send a copy of THE HEATING AND VENTILATING MAGAZINE to T. Kono, for I feel certain he will subscribe and will appreciate both advertisements and editorials. We should try to have Japan know us better, and we would profit by a more intimate intercourse with the people of Japan.

Norristown, Pa. JOHN GORMLY.

Likes Community Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

In THE HEATING AND VENTILATING MAGAZINE for January, I note a very interesting and instructive article on the "Future of House Heating" by Harold L. Alt, which arrives at the conclusion that "Community Heating" is going to be the logical outcome in many cases.

Community and municipal heating has proven itself to be a most efficient as well as convenient mode of heating large areas of buildings, homes, etc., in cities where it has been tried out under favorable franchises, properly installed plants and good management during the last half century.

Any city having a municipal electric plant of its own, for furnishing its streets with light, could utilize its exhaust steam to great advantage, by carrying same through large, covered pipes, in ditches used along the sidewalks, for accommodating the municipally supplied street lights; same could be enlarged enough to accommodate the steam pipes, insulation, etc., plugged tees left in the supply and return lines to accommodate each building as same were being extended adjacent thereto.

The same office force, meter readers, inspectors, etc., with the addition of repair men, could be utilized in taking care of this department, mailing and collecting bills, etc.

Under above conditions, steam heat could be furnished householders, office buildings, stores, etc., at a minimum production cost, thus placing its use, within the reach of all buildings, home owners, etc., along the supply lines, at a cost attractive enough, to cause people of moderate means to take advantage of it, to their great comfort, cleanliness and economy; while users of same would do away with all anxiety and care of an isolated heating plant, including the dirt and nuisance of the ashes.

A large city with a municipally operated central heating plant, supplying its citizens quite generally with heat; with a smoke ordinance causing the use in isolated heating plants, of gas, coke or two grate, down draft boilers, which are actually smokeless, when operated under proper conditions, all other things being equal, would prove a mecca, for people desirous of making a home, where surroundings and conditions are inviting; they would locate there, build fine, large beautiful residences, enter into various lines of business activities, causing a great increase of desirable population, making for wealth and prosperity.

Dense volumes of black smoke are a detriment to any city in every way. It puts individuals, corporations, etc., to great expense, is unhealthy and a great nuisance as well as a tremendous waste.

I hope to see further articles in your magazine on the subject.*

THEO. W. STARBUCK.

*Our correspondent will find further discussion along this line in The Heating and Ventilating Magazine for February and March.

AMERICAN PEERLESS WALL RADIATORS is the subject of a new booklet being circulated by the American Radiator Co., 40 West 40th St., New York. This catalog is devoted entirely to wall radiators, details of same, piping connections, methods of support, assembling, and picture of typical installations. Size 5 in. x 9 in. Pp. 64.

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with	
Fenestra	100	Inner Vestibule Doors	100

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTRACT

STANDARD RADIATION

SHOWING RADIATION REQUIRED

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALLS														
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Conc.		
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"	16"
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225	60.5	71.5	25.0	50.0	100	200	23.1	17.6	14.3	20.9	16.0	13.8	14.9	12.7	11.6	16.5	14.3	12.1	33.0	26.4	22.6
1	3.72	3.15	9.0	4.5	2.25	1.125	9.7	12.8	15.7	10.8	14.1	16.3	15.1	17.7	19.4	13.6	15.7	18.6	6.8	8.5	10.0
2	7.44	6.30	18.0	9.0	4.50	2.25	19.4	25.6	31.4	21.6	28.2	32.6	30.2	35.4	38.8	27.2	31.4	37.2	13.6	17.0	20.0
3	11.2	9.45	27.0	13.5	6.75	3.38	29.1	38.4	47.1	32.4	42.3	48.9	45.3	53.1	58.2	40.8	47.1	55.8	20.4	25.5	30.0
4	14.9	12.6	36.0	18.0	9.00	4.50	38.8	51.2	62.8	43.2	56.4	65.2	60.4	70.8	77.6	54.4	62.8	74.4	27.2	34.0	40.0
5	18.6	15.8	45.0	22.5	11.3	5.63	48.5	64.0	78.5	54.0	70.5	81.5	75.5	88.5	97.0	68.0	78.5	93.0	34.0	42.5	50.0
6	22.3	18.9	54.0	27.0	13.5	6.75	58.2	76.8	94.2	64.8	84.6	97.8	90.6	106	116	81.6	94.2	112	40.8	51.0	60.0
7	26.0	22.1	63.0	31.5	15.8	7.88	67.9	89.6	110	75.6	98.7	114	106	124	136	95.2	110	130	47.6	59.5	70.0
8	29.8	25.2	72.0	36.0	18.0	9.00	77.6	102	126	86.4	113	130	121	142	155	109	126	149	54.4	68.0	80.0
9	33.5	28.3	81.0	40.5	20.2	10.1	87.3	115	141	97.2	127	147	136	159	175	122	141	167	61.2	76.5	90.0
10	37.2	31.5	90.0	45.0	22.5	11.3	97.0	128	157	108	141	163	151	177	194	136	157	186	68.0	85.0	100
11	40.9	34.7	99.0	49.5	24.8	12.4	107	141	173	119	155	179	166	195	213	150	173	205	74.8	93.5	110
12	44.6	37.9	108	54.0	27.0	13.5	116	154	188	130	169	196	181	212	233	163	188	223	81.6	102	120
13	48.4	41.0	117	58.5	29.2	14.6	126	166	204	140	183	212	196	230	252	177	204	242	88.4	111	130
14	52.1	44.1	126	63.0	31.5	15.8	136	179	220	151	197	228	211	248	272	190	220	260	95.2	119	140
15	55.8	47.2	135	67.5	33.7	16.9	146	192	236	162	212	245	227	266	291	204	236	279	102	128	150
16	59.5	50.4	144	72.0	36.0	18.0	155	205	251	173	226	261	242	283	310	218	251	298	109	136	160
17	63.2	53.5	153	76.5	38.2	19.1	165	218	267	184	240	277	257	301	330	231	267	316	116	145	170
18	67.0	56.7	162	81.0	40.5	20.3	175	230	283	194	254	293	272	319	349	245	283	335	122	153	180
19	70.7	59.9	.171	85.5	42.8	21.4	184	243	298	205	268	310	287	336	369	258	298	353	129	162	190
20	74.4	63.0	180	90.0	45.0	22.5	194	256	314	216	282	326	302	354	388	272	314	372	136	170	200
21	78.1	66.1	189	94.5	47.2	23.6	204	269	330	227	296	342	317	372	407	286	330	391	143	179	210
22	81.8	69.3	198	99.0	49.5	24 8	213	282	345	238	310	359	332	389	427	299	345	409	150	187	220
23	85.6	72.4	207	104	51.8	25.9	223	294	361	248	324	375	347	407	446	313	361	428	156	196	230
24	89.3	75.7	216	108	54.0	27 0	233	307	377	259	338	391	362	425	466	326	377	446	163	204	240
25	93.0	78.8	225	113	56.2	28.1	243	320	393	270	353	408	378	443	485	340	393	465	170	213	250

TORS NATIONAL ASSOCIATION
ESTIMATING TABLE
FOR QUANTITIES INDICATED

tion than that Shown SeeHeating and Piping Contractors National Association Engineering Standards.

PROVIDENCE, RHODE ISLAND

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	$70°=T_i$	N	1.50	S	1.10
Base Temperature	$+15°=T_o$	N E	1.25	S W	1.25
Base Temp. +15° Equivalent to		E	1.00	W	1.50
Guarantee Temp. of 0° Outside		S E	1.00	N W	1.50

						ROOF				Base Floor		Interm'e Floor			Ceiling		Partition			Type
onc. Fur L. P.			Frame Std.	Frame No Sh'g	Frame No L. P.	T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g	Sh'gle Sh'g L. P.	Conc. on Earth	Wood on Sleep.	4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Lath and Plas.	L & P Wo. Fl. Over	Stud L & P 1 Side	Stud L & P 2 Side		Kind
8"	12"	16"																		Thick.
50	.40	.34	.24	.31	.35	.30	.60	.40	.30	.31	.13	.20	.15	.20	.49	.28	.60	.33		K
7.5	22.0	18.7	13.2	17.1	19.3	16.5	33.0	22.0	16.5	8.55	3.58	5.5	4.13	5.5	13.5	7.7	16.5	9.08		K(T₁-To)
3.2	10.2	12.0	17.0	13.2	11.7	13.6	6.8	10.2	13.6	26.3	62.9	40.9	54.5	40.9	16.7	29.2	13.6	24.8		1
5.4	20.4	24.0	34.0	26.4	23.4	27.2	13.6	20.4	27.2	52.6	126	81.8	109	81.8	33.4	58.4	27.2	49.6		2
4.6	30.6	36.0	51.0	39.6	35.1	40.8	20.4	30.6	40.8	78.9	189	123	164	123	50.1	87.6	40.8	74.4		3
2.8	40.8	48.0	68.0	52.8	46.8	54.4	27.2	40.8	54.4	105	252	164	218	164	66.8	117	54.4	99.2		4
1.0	51.0	60.0	85.0	66.0	58.5	68.0	34.0	51.0	68.0	132	315	205	273	205	83.5	146	68.0	124		5
9.2	61.2	72.0	102	79.2	70.2	81.6	40.8	61.2	81.6	158	377	245	327	245	100	175	81.6	149		6
7.4	71.4	84.0	119	92.4	81.9	95.2	47.6	71.4	95.2	184	440	286	382	286	117	204	95.2	174		7
5.6	81.6	96.0	136	106	93.6	109	54.4	81.6	109	210	503	327	436	327	134	234	109	198		8
3.8	91.8	108	153	119	105	122	61.2	91.8	122	237	566	368	491	368	150	263	122	223		9
2.0	102	120	170	132	117	136	68.0	102	136	263	629	409	545	409	167	292	136	248		10
0.2	112	132	187	145	129	150	74.8	112	150	289	692	450	600	450	184	321	150	273		11
8.4	122	144	204	158	140	163	81.6	122	163	316	755	491	654	491	200	350	163	298		12
107	133	156	221	172	152	177	88.4	133	177	342	818	532	709	532	217	380	177	322		13
115	143	168	238	185	164	190	95.2	143	190	368	881	573	763	573	234	409	190	347		14
123	153	180	255	198	176	204	102	153	204	395	944	614	818	614	251	438	204	372		15
131	163	192	272	211	187	218	109	163	218	421	1006	654	872	654	267	467	218	397		16
139	173	204	289	224	199	231	116	173	231	447	1069	695	927	695	284	496	231	422		17
148	184	216	306	238	211	245	122	184	245	473	1132	736	981	736	301	526	245	446		18
156	194	228	323	251	222	258	129	194	258	500	1195	777	1036	771	317	555	258	471		19
164	204	240	340	264	234	272	136	204	272	526	1258	818	1090	818	334	584	272	496		20
172	214	252	357	277	246	286	143	214	286	552	1321	859	1145	859	351	613	286	521		21
180	224	264	374	290	257	299	150	224	299	579	1384	900	1199	900	367	642	299	546		22
189	235	276	391	304	269	313	156	235	313	605	1447	941	1254	941	384	672	313	570		23
197	245	288	408	317	281	326	163	245	326	631	1510	982	1308	982	401	701	326	595		24
205	255	300	425	330	293	340	170	255	340	658	1573	1023	1363	1023	418	730	340	620		25

←——These Items Figured on Basis of K $\left(\frac{T_i-T_o}{2}\right)$ ——→

zine's Data Sheet No. 13 D 3

How to Use the Providence Table

Figure from the plans the number of square feet of wall, glass and lineal feet of crack for each exposure. Find the nearest corresponding quantity in appropriate column. Then read horizontally to extreme right- or left-hand column for square feet of radiation required. Add additional amount for exposure, as shown in upper right-hand square of data sheet.

For example, for Providence, R. I.: 70 sq. ft. of 12-in. brick wall. Read down the column headed "Plain brick, 12-in."; the nearest corresponding figure in the table falls between 64.0 and 76.8. Following horizontally to extreme left or right shows 5.5 sq. ft. of 38-in. 3-col. radiation. If wall faces north, multiply by 1.5, making 8.25 sq. ft. actually required.

If the same wall has 30 sq. ft. of glass or door, the figure in the table, under "Glass" is 29.8, or, say, 8 sq. ft. This figure, multiplied by exposure factor, 1.5, equals 12 sq. ft. If window has 39 lin. ft. of crack and is double-hung wood sash, without weather strips, the corresponding figure in the table (using the column headed "50" under "Infiltration") is 40.5, or 9 sq. ft. of radiation. Multiplying by 1.5, for exposure, equals 13.5 sq. ft. of radiation.

The three quantities—8.25, 12 and 13.5—equal 33.75, or, for simplicity, 34 sq. ft. as the total radiation required for this exposure. The three quantities for any one exposure can be added together and then multiplied by the exposure factor to obtain the same result. No exposure factor is to be used for roofs, floors, ceilings, or partitions or skylights unless skylights are vertical or practically vertical.

The factor in the last column is the number of B.T.U. per lineal foot of crack per hour per degree difference in temperature.

American Society of Heating and Ventilating Engineers

Abstracts of Papers Presented at the Annual Meeting

In addition to the outline of various papers presented at the Annual Meeting of the A.S.H. and V.E., held in St. Louis, January 25-28, and published in THE HEATING AND VENTILATING MAGAZINE for February, were several papers which space conditions made it necessary to carry over into a later issue.

Design and Operation of Hotel Heating and Ventilating Systems

Mr. Natkin has taken a typical example of his work to exemplify the functions of a heating and ventilating engineer in co-operating with the architect and owner to produce a hotel plant that will be reliable to the last degree, economical to operate and, of course, represent a minimum expenditure.

The Hotel President is located in Kansas City, in a comparatively warm climate, and presented the usual items for consideration; a heating system, hot-water service, steam for kitchen, laundry steam and water, steam for valet and steam for barber shop sterilizer.

Climatical considerations led to the plan of locating the various dining rooms so that natural cooling could be obtained. The large banquet halls were placed on the top floor, with ample windows for the long summer season. A small banquet room and a coffee shop on the second and first floors require artificial ventilation.

Following conventional considerations of the various means of providing for steam and electric service, the solution was arrived at through a fortunate combination of local conditions. Normal rates for electricity were too high, largely because of the distribution cost at low potentials available. The recent installation of a high-potential downtown loop enabled the local utility-company to make a rate for current as low as the computed cost, figuring on a private plant burning oil.

Another fortunate factor lay in the fact that the local district steam plant is but 300 ft. from the site of the hotel; a direct private main carrying steam at 100 lbs. pressure solved that problem.

A vacuum return line was installed for all the various steam systems; condensate is collected in the sub-basement where a duplex installation of centrifugal vacuum pumps discharge into an open receiver.

Ventilation of the banquet rooms on the top floor was provided without mechanical means. A special type of window was used, it being possible to slide the window into the overhead structure, and this was found ample for every summer requirement. In winter, revolving siphon-type ventilators draw air from registers in the roof, and, through the first winter, this plan has proved very satisfactory, even when the rooms were filled with after-dinner smokers.

Mr. Natkin stated that the hotel had been operated through an entire year and that the heating and ventilating had been accomplished to the satisfaction of all concerned at a cost nearly 15% less than the estimated figures.

Turbulence and Heat Transfer

In presenting this paper Mr. Bousquet stated that his purpose was to supply data showing the effect of the kind of air flow set up by a fan on the rate of heat transfer of two types of indirect heaters, namely, the cellular and the fin-and-tube types.

"When air is blown through a duct by means of a centrifugal fan or blower," said Mr. Bousquet, "it assumes a condition approaching parallel air flow in traveling only a comparatively short distance. Air drawn through a straight duct by means of an exhauster attains almost perfect viscous air flow. On the other hand, an air blast from a disc or propeller fan travels in a spiral manner. In such a case, not only is there turbulence due to the main blast traveling in a spiral, but there is also turbulence due to the small vortices surrounding the main spiral of air. This turbulence set up by a propeller or disc fan causes a significant increase in the rate of heat dissipation from a heating surface which in itself does not cause a large amount of turbulence.

Heaters were tested in two different ways. First, the rate of heat dissipation was measured in a wind tunnel where parallel air flow obtained as nearly as possible. Air was drawn through the tunnel by means of an exhauster. The air entered through a bell-shaped intake and passed through a wind straightener.

In the second case, the wind tunnel was used in obtaining the over-all heat transfer coefficients. In this wind tunnel, disc and propeller fans were used as a means of forcing the air through the heater, giving turbulent flow. It was found that the distance between the heater and the fan in this apparatus had a decided effect on the rate of heat dissipation. This is to be expected, when it is considered that air coming through a disc or propeller fan, after it has traveled about 2 ft. has lost most of its turbulence. The data reported in this paper for turbulent air flow were obtained with the fan placed from 4 to 6 in. from the heater.

The same methods of testing and computing the results were used in both cases. The apparatus was run until equilibrium was reached. Precautions were taken against entrapped air and condensate in the line. The latter was

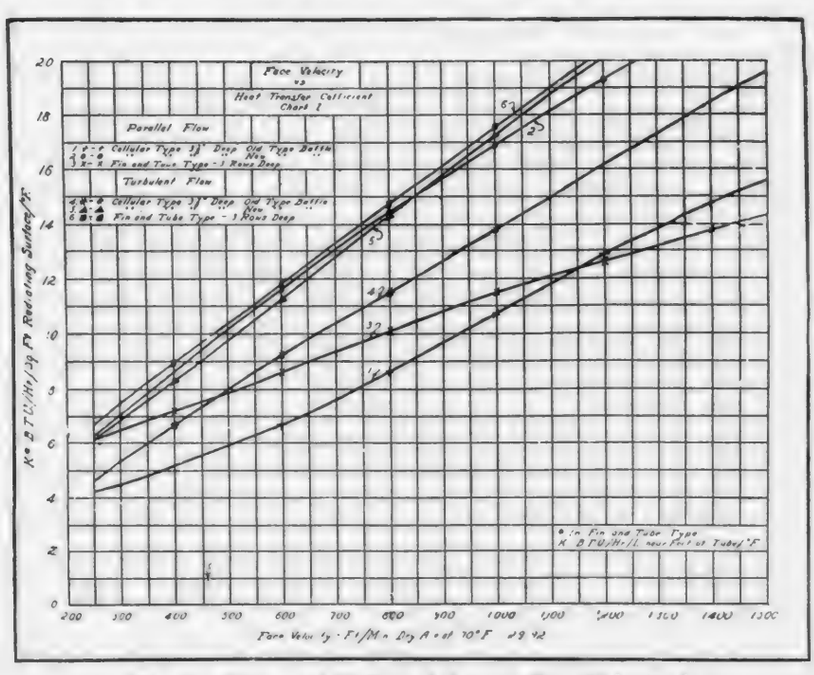


Fig. 1. Values of K Plotted Against Face Velocity for Three Types of Heaters

assured by the use of steam somewhat superheated. All tests were made with steam at 5 lbs. gage. In both cases the air temperatures were measured by means of a bank of resistance thermometers, giving instantaneous readings of the average temperature of both inlet and outlet air. Steam temperatures were measured by means of mercurial thermometers inserted in the steam line by means of mercury wells.

In chart Fig. 1, curves are given in which the values of K are plotted against face velocity for three kinds of heaters. Here

$$K = \frac{\text{Lb. cond./hr.} \times \text{latent heat of steam}}{\text{sq. ft. surface} \times TD}$$

Where

TD = temperature difference =

$$t_3 - \left[\frac{(t_2 + t_1)}{2}\right]$$

with

t_1 = temperature of inlet air deg. F.
t_2 = temperature of outlet air deg. F.
t_3 = temperature of steam, deg. F.

Curves 1 to 3 inclusive are for parallel air flow, while curves 4 to 6, inclusive, are tor turbulent flow.

For heaters No. 1 and No. 3 there is a decided increase in the value of K for a given velocity. In the case of heater No. 2 there is practically no difference in the values of K for the two types of air flow. This particular heater was purposely designed to give a tremendous amount of turbulence to the air passing through it.

In chart, Fig. 2, the frictional loss curves are given as obtained in the parallel air-flow tunnel. No friction loss data were obtained with the other wind tunnel.

In chart, Fig. 3, K values have been plotted against friction loss. It will be noted that heater No. 2, giving a large amount of turbulence, has the highest K values for a given friction loss.

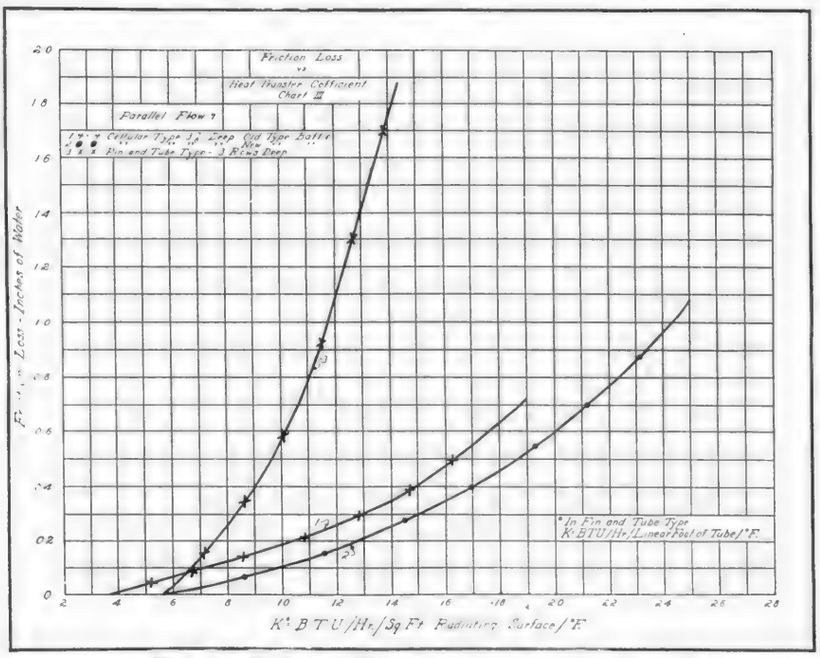

Friction Loss vs Heat Transfer Coefficient Chart II
Parallel Flow
Ft. Air Loss - Inches of Water
K: B T U/Hr./Sq Ft Radiating Surface/°F.
* In Fin and Tube Type K: BTU/Hr./Linear Foot of Tube/°F.

Fig. 3. K Values Plotted Against Friction Losses

In the following table comparative data are given for the two types of air flow for the three heaters under consideration.

Incidentally, it was found that the usual method of estimating the volume of air handled by a given fan, when used in conjunction with heaters such as were tested, was not applicable with any degree of accuracy. Propeller and disc fans do not deliver their rated capacity under these conditions of use.

COMPARATIVE DATA FOR PARALLEL AND TURBULENT FLOW

Face Velocity 600/Ft./Min. Steam 227° F. 5 lbs. gage	Parallel Flow		Inlet Air 0 Deg. F. Turbulent Flow	
Heater	F. T.* deg. F.	C lb./sq. ft.	F. T.* deg. F.	C lb./sq. ft.
1. OTB—3⅞	69.0	1.34	89.9	1.75
2. NTB—3⅞	108.0	2.09	106.0	2.05
3. Fin and Tube	65.5	1.70**	88.3	2.25**

* F. T. = final temperature.
** = lb. per linear foot.

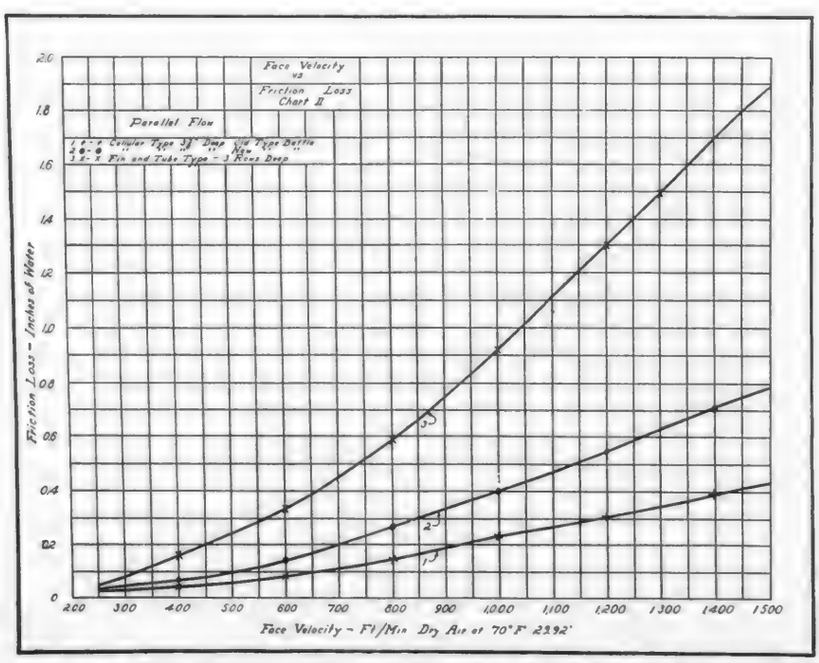

Face Velocity vs Friction Loss Chart II
Parallel Flow
Friction Loss - Inches of Water
Face Velocity - Ft/Min Dry Air at 70°F 29.92"

Fig. 2. Frictional Loss Curves Obtained in Parallel Air Flow Tunnel

For instance, a fan rated to deliver 2000 C.F.M. against a static of 0.156 in., when running at 850 R.P.M., will not force that volume of air through a unit heater which has a frictional loss of 0.156 in. In order to obtain that delivery, the fan must be run more than 850 R.P.M. The discrepancies found were too large to be attributed to experimental error. Another interesting thing was observed, namely, that the power required to handle a definite volume of air by a given fan did not differ for the two heaters, No. 1 and No. 2, in spite of the fact that their frictional loss curves are materially different.

The type of air flow set up by a fan used with an indirect heater has a significant effect on the rate of heat transfer. Parallel or viscous flow gives lower rates of heat dissipation than turbulent flow unless the heating surface be of such a design as to give a tremendous amount of turbulence in itself.

When indirect heaters are used with disc or propeller fans acting as blowers, and placed not more than 5 in. to 6 in. away from the face of the heater, a condition of turbulence exists, giving a maximum rate of heat transfer.

American Society of Heating and Ventilating Engineers

White Sulphur Springs Selected as Summer Meeting-Place

Announcement is made that the next summer meeting of the American Society of Heating and Ventilating Engineers will be held in White Sulphur Springs, W. Va., June 28-30, 1927.

Committee Appointments

Committee appointments have been announced by the American Society of Heating and Ventilating Engineers as follows:

Council: Executive, A. C. Willard, chairman; Thornton Lewis, John Howatt; Membership, W. E. Gillham, chairman; C. V. Haynes, W. T. Jones; Finance, Thornton Lewis, chairman; W. H. Driscoll, E. B. Langenberg; Publication, F. B. Rowley, chairman; W. H. Carrier, A. C. Willard; Program, E. B. Langenberg.

Technical Advisory Committees: Executive, S. R. Lewis, chairman; S. E. Dibble, H. M. Hart, A. C. Willard; Pipe Sizes, H. M. Hart, chairman; D. S. Boyden, T. M. Dugan, C. F. Eveleth, C. V. Haynes, J. H. Walker; Infiltration, A. C. Willard, chairman; D. Knickerbacker Boyd, L. A. Harding, E. B. Langenberg, A. P. Kratz, W. S. Timmis; Radiation, F. D. Mensing, chairman; R. V. Frost, J. C. Lewis, F. B. Rowley.

Illinois Chapter Discusses Research Laboratory Activities

Present and proposed activities of the A.S.H. & V.E. Research Laboratory were the main topic for discussion at the February meeting of the Illinois Chapter, held in the Chrystal Room of the Hotel Sherman, Chicago, February 14. Eighty-one members and guests were present.

Samuel Lewis made his first appearance as chairman of the society's Committee on Research. He presented a paper in which he outlined the proposed activities of his committee and of the laboratory. He said the committee is now working on a plan which, he hoped, would permit of the opening up of the laboratory for making tests for allied organizations. Mr. Lewis has volunteered to draw up a contract covering such tests. This policy, he said, will not only help the laboratory, but will be a benefit to the public.

PROPOSES COMMERCIAL TESTING

Although the present income from the society pays most of the expenses of the laboratory, there is a gap of $3000 which must be filled and this, he said, could be met through payments for research work. Care would have to be taken to keep such research free from entanglement with proprietary interests. It is his idea that the work should be done at cost.

After outlining the investigations now being carried on at the laboratory, he stated that it was intended to encourage heating and ventilating research at the various universities. He mentioned particularly some tests that were about to be undertaken at the University of Wisconsin on infiltration. This work, he stated, would have an additional value in its effect on the students at the universities because, after graduation, they would remember the society and know more of the work of the heating and ventilating engineer.

Mr. Lewis stated further that the anticipated work on the rating of heating boilers promised much and he hoped it would not be long before this work would be undertaken.

Director F. C. Houghten, of the Research Laboratory, who followed Mr. Lewis, reviewed the present status of the work at Pittsburgh, as given in his annual report to the society. In the ensuing discussion, Mr. Lewis stated that the time is now ripe for the society and laboratory to devote more time and effort to practical tests. He stated that the committee will welcome suggestions and criticisms in this connection.

Mr. Lewis read a letter from Perry West, former chairman of the Committee on Research, in which Mr. West expressed himself as not in favor of commercial testing, but he did favor something in the nature of a clearing house in co-operation with other engineering societies on a basis similar to that of the certified heating plant and national in scope. Mr. West felt that the Research Laboratory, as such, should confine itself to research and avoid commercial testing.

Mr. Lewis, in commenting on this letter, offered, as an example, the absence of a satisfactory method of rating boilers. His idea, as he explained it, was that the laboratory might do testing work for organizations controlling all the output for a given industry.

The savings effected through the decrease in the number of pipe sizes was mentioned as having been due directly to research work. H. M. Hart stated that it was difficult to distinguish between commercial testing and research work. The engineer, he said, arrives by computation at a factor for a compound wall, but the testing of these wall materials, he thought, would be research work and, therefore, it would be only fair to have the manufacturers of wall materials bear part of the expense to determine the desired factors. Mr. Hart said he would much prefer to have all materials tested under one standard method and he hoped an arrangement would be worked out which would avoid the stigma of commercial testing.

Homer Linn endorsed the thoughts expressed by Mr. Hart, declaring that he doubted if 5% of the society's members knew what fine work Mr. Houghten and his associates are doing at the laboratory.

At the opening of the meeting President Martin introduced Russell Donnelly, who told of the pioneer days of the society. Reuben N. Trane, of La Crosse, Wis., was unanimously elected to membership in the chapter. Mr. Hart was called on to tell the story of the society's St. Louis meeting, and in the course of his remarks, he mentioned the fact that the Chicago delegation numbered 36 members and 15 guests.

President Martin then announced the appointment of Mr. Lewis as chairman of the Committee of Research and turned the meeting over to him.

New York Chapter

The Federal Reserve Bank and how it operates was the topic discussed at the February meeting of the New York Chapter, held February 21 at the Building Trades Club.

W. Randolph Burgess, assistant federal reserve agent for the Federal Reserve Bank in New York City, presented in plain and simple language the way the Federal Reserve Bank functions and illustrated with charts the influence this bank has had on various financial conditions.

The speaker for the March meeting of the Chapter will be H. W. Corbett, architect, who will talk on high buildings.

Michigan Chapter Discusses Insulation of Buildings

The insulation of buildings was the main topic for discussion at the January meeting of the Michigan Chapter, held at the Detroit Engineering Club, January 17. J. H. Bracken, of the Celotex Company; E. C. Lloyd, of the Armstrong Cork Company, and Clark Keeler, of the Univerasl Lime & Gypsum Company, were the principal speakers. The talks were illustrated by motion-picture slides. Fifty members and guests were present.

A varied program covering weather-stripping, domestic hot water service with oil burners and a power plant installation furnished an instructive evening for the Michigan Chapter at their February meeting held at the Detroit Engineering Club Rooms, February 14.

The talk on weather-stripping, which was accompanied by illustrative slides, was given by H. M. Whitten of the Chamberlain Metal Weather Strip Company. Mr. Whitten's talk was followed

by an outline of the details in heating water for domestic use in summer time with oil burners, thermostatically controlled. This discussion was presented by W. T. Harms, past president of the Michigan Chapter.

Engineering features of the new Morrell Street power plant for the city of Detroit were illustrated and described by H. L. Walton and C. R. Gifford, both of Smith, Hinchman and Grylls.

Western New York Chapter Learns About Certified Heating

What certified heating means and how it works in other States, was explained to the members and guests of the Western New York Chapter at its February meeting, held at the Hotel Buffalo, Buffalo, N. Y., February 8. The speakers included Joseph C. Fitts, assistant secretary of the Heating and Piping Contractors National Association, and Manager A. R. Herske of the Heating and Piping Contractors Cleveland Association. Roswell Farnham gave an interesting outline of the society's annual meeting in St. Louis in January.

R. M. Milligan Architect of St. Louis Schools

In connection with the types of heating and ventilating systems used in the St. Louis schools, due credit is given by E. S. Hallett, chief engineer, to R. M. Milligan, architect and commissioner of school buildings in St. Louis, for his fine support and co-operation in the design of the buildings. Mr. Milligan is the architect for all of the outstanding buildings recently built in St. Louis, which are attracting so much attention.

In the presentation, in last month's issue, of a paper by William B. Ittner, it was inadvertently stated that he was the architect for the St. Louis schools. The word "former" should have been inserted, as Mr. Ittner has had no connection with the St. Louis schools for the past fourteen years.

Opposition to the Five-Day Week

At a meeting of over 150 contractors from 25 of the larger cities, as well as representatives of nearly all of the State and National associations, held in Pittsburgh, December 13, 1926, under the auspices of the National Association of Building Trades Employers, the consensus of opinion was not only against wage increases for 1927, but also severely condemned the five-day week.

It was claimed that the five-day proposition would not alone serve as a basis to charge up increased overtime by the employees, but would also add to construction costs.

Chicago Oil-Burner Dealers Discuss Local Permit Situation

All attendance records were broken at the February luncheon meeting of the Chicago Oil Burner Association, held February 8, at the Allerton Club, Chicago. Mr. Breed, of the Underwriters' Laboratories, spoke briefly on the Laboratories' label service. Copies were distributed of the supplement to the Underwriters' list of approved burners as of July, 1926. Mr. Breed invited suggestions on the label service.

Mr. Sladke, a Chicago attorney, was the principal speaker, his subject being the Chicago code and the recent attempt at its enforcement. The existing code was drafted in 1911 by the Chicago Health Department, Mr. Sladke explained, when no thought or attention was given to oil burners and to their relation to public health and safety. The Health Department is now attempting to regulate the issuing of permits for oil-burner installations for the suspected purpose, Mr. Sladke said, of securing revenue.

According to Mr. Sladke, the Health Department, under the statutes, cannot enforce an ordinance for revenue only and oil burners require no such inspection, since burners have no bearing on public health.

The ordinance would insist on health department permits for "new plants or reconditioning of plants," Mr. Sladke said, and he believed the matter could be successfully argued in the interests of the oil-burner industry with the corporation counsel.

Mr. Sladke believed regulation and control over the amount of heating, number and location of windows, doors, airshafts, etc., were properly in the province of the Health Department but that change of fuel from coal to oil was not "reconstruction," and he believed the courts would agree with this view.

It is against the law, he stated, to place all authority in one head, such as the Health Commissioner, who could arbitrarily grant or refuse permits. Mr. Sladke's opinion was that the measure is also unconstitutional in that it fails to provide a condition for which permits could be issued. The measure, Mr. Sladke said, is not properly a health measure, but now stands as a safety measure. He stated that the health department had no authority to determine whether or not a plant could do what it was intended.

COURSES OPEN TO THE ASSOCIATION

The association, said Mr. Sladke, could (1) comply and pay fees; (2) argue with the Health Department. If not successful it could (3) offer defense, since the Health Department would stop work and arrest the workmen. One arrest would make a test case before the Municipal Court, and if the judge of this court sustained the association's stand, this would be satisfactory. It might result in the Health Department's going to the corporation counsel to have a stiff ordinance adopted or some modification made. There was a likelihood of the test case going to the Supreme or Appellate Court. If, in the interim, the Health Department enforced its measure, the association members would have to pay fees under protest. Doubtless an injunction could be secured, or the matter referred to a master in chancery. If a new ordinance came before the City Council, the association would have to appear against it.

Homer Linn stated that a heating ordinance for Chicago and also an oil-burner ordinance was in the making, he had heard, and, as a member of the council of the Association of Commerce, he knew that association could render effective assistance to the oil-burner association.

It was stated that the Chicago health commissioner and several department doctors had burners in their homes.

Upon motion by Mr. Straight, which was passed, Mr. Sladke was commissioned to proceed in the interests of the association and to co-operate with Mr. Linn in securing the support of the Association of Commerce.

BILLBOARD CAMPAIGN TO BE CONTINUED

It was announced that the billboard campaign in Chicago on oil fuel was to be continued another three years. President Kyle announced that the reprints of the article, "How Many Gallons of Oil Equal a Ton of Coal?" were distributed through the courtesy of THE HEATING AND VENTILATING MAGAZINE. He also announced that the association headquarters and mailing address was the Chicago office of THE HEATING AND VENTILATING MAGAZINE.

Mr. Johansen, of the Hays Institute of Combustion, told of the class groups from the coal industry that were being instructed in combustion and he expressed the willingness of the institute to work out a course for the oil-burner men. Upon an expression of approval by the members, Mr. Johansen was requested to submit a proposition.

Mr. Fahey read a paper on trade practices in connection with tank sales. The abuses and conditions objected to are to be taken up by a committee of burner and tank men, appointed at the instance of Mr. Price, and a report made at the next meeting of the association.

In the description of the new Herman Nelson unit heater, on page 113 of THE HEATING AND VENTILATING MAGAZINE for February, the address of The Herman Nelson Corporation was given as Olean, Ill. This should have been Moline, Ill.

National District Heating Association

Program for Forthcoming Annual Meeting

Included in the tentative program for the eighteenth annual convention of the National District Heating Association, to be held at West Baden Springs Hotel, West Baden, Ind., May 17-20, are the following addresses and reports:

May 17 (Afternoon)—Address of president and reports of secretary-treasurer, Executive, Membership, Educational and Operating Statistics Committees.

May 17 (Evening)—Address by C. W. Organ, of the Illinois Power Company, on "Combined Electric and Heating Plants Operated as Heating Stations, with Electricity as a By-Product."

Report of the Development and Research Committees, illustrated by moving pictures and lantern slides.

May 18 (Morning)—Report of Station Operating Committee, I. E. Powell, chairman.

Address by Prof. J. D. Hoffman, of Lafayette, Ind., on "A Design for a New Underground Heating and Power Intercommunicating System for Purdue University."

Report of Distribution Committee.

May 19 (Morning)—Report of Rates and Regulations Committee, John W. Meyer, chairman.

Heat Utilization Committee, dealing with Demand Studies, and

Meter Committee, dealing with Demand Meters, also

Addresses by Herbert Janvrin Brown, of Washington, D. C., on "Long-Distance Weather Forecasting."

May 20 (Morning)—Reports of Heat Utilization and Meter Committees.

Address by Mr. Hunter, of the Buhl Land Company, Detroit, Mich., on "Orifice Method of Steam Distribution"; also

Round Table on small plant operation and Manufacturers' Round Table.

Last Call for Second Heating and Ventilating Exposition

In circular broadcast by E. P. Frenz, manager of the National Heating and Ventilating Exposition, a "last call" is sounded for the Second National Heating and Ventilating Exposition, at the Twelfth Regiment Armory, 61st to 62nd Street and Columbus Avenue, New York, March 14 to 19, next. A diagram of the exposition hall is included showing the spaces sold and those still available.

The Twelfth Regiment Armory is one block from Broadway and may conveniently be reached by the Interborough subway or by the Sixth and Ninth Avenue elevated railways.

New Secretary for British Heating Engineers' Society

The (British) Institution of Heating and Ventilating Engineers, has appointed H. B. Watt as secretary, to fill the position left vacant by W. G. Hollinworth, who was obliged to resign on account of ill health. Mr. Watt assumed his new duties January 1.

On December 25 the institution moved from 38 Victoria St., to its new quarters at 12 Russell Square, London, W. C. 1.

Bad Air Is Bad Business

ONE of the most effective pieces of advertising copy yet designed to bring home the ill effects of poor ventilation has recently been put out by the American Blower Company, Detroit, Mich., under the caption, "Bad Air Is Bad Business." Bad air is depicted as a vulture-like character who goes about defiling everything with which he comes into contact.

"Just follow Bad Air around your place of business for an hour or so," reads the text, "and watch him at his destructive work."

"'Be impolite,' he whispers to a clerk—and you lose a customer. 'Do it tomorrow,' he says to a bookkeeper—and you lose a discount. 'One hour till quitting time,' he shouts through the factory, and production drops. 'Pretty stuffy in here,' he suggests to each individual customer, 'better not come back.'

"Almost unchallenged, he stalks, and wherever he goes he drops Red Ink on the balance sheet. Yet, there is—easily available—a remedy that is simple, inexpensive, sure."

The advertisement then goes on to extol the advantages of the company's mechanical ventilating equipment for supplying "invigorating, oxygen-laden air to every out-of-the-way corner of the smallest store or the largest industrial building."

The Contractor's Big Problem

One of the biggest problems the contractor faces today, declared Colonel Willard T. Chevalier, manager of *Engineering News-Record*, speaking on the subject of "Price vs. Service in Construction Sales" before American General Contractors, is the selling of his services on such a basis that he will build up permanent business. As Colonel Chevalier pointed out, what the contractor has to sell is his skill, responsibility and integrity, and selling his service on a price basis is in reality not selling these qualities at all.

The contractor, he said, does not talk about selling his services but talks about "getting a job." The engineer, the architect or the owner does not talk about buying the contractor's services; each talks about "letting the job." This complex is with us. It is the biggest problem for the contractor.

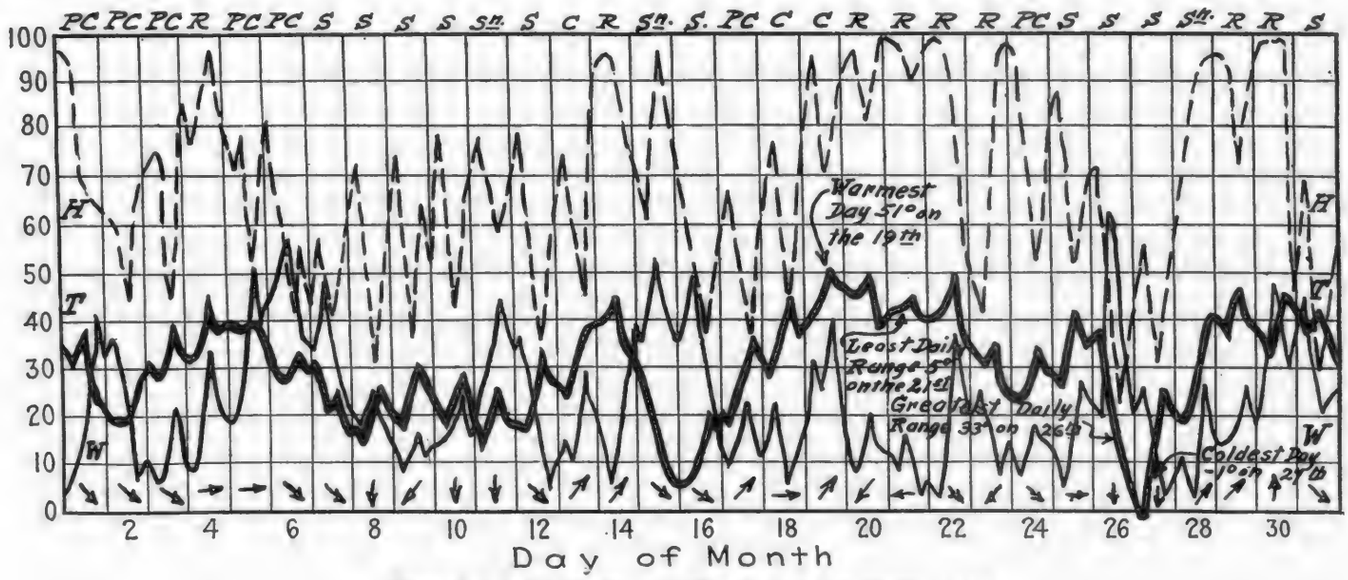
Sesquicentennial Exposition Awards for Heating Products

Gold medal awards to a number of heating concerns for excellence of workmanship and completeness of design have been announced by the Sesquicentennial Exposition in Philadelphia. Among these is the S. T. Johnson Co., San Francisco, manufacturer of the Johnson oil burner. The S. T. Johnson Company is one of the pioneers in oil-burner manufacturing, having been engaged continuously and exclusively in this business for 22 years.

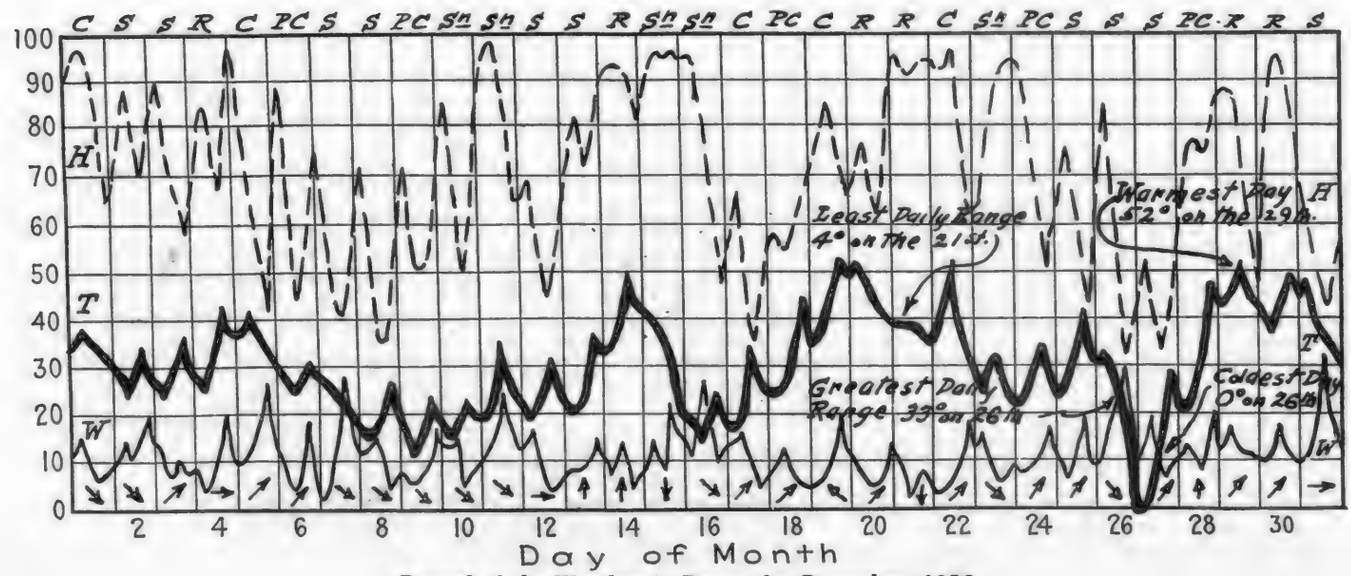
American Blower Company's Conception of "Bad Air is Bad Business"

The Weather for January, 1927

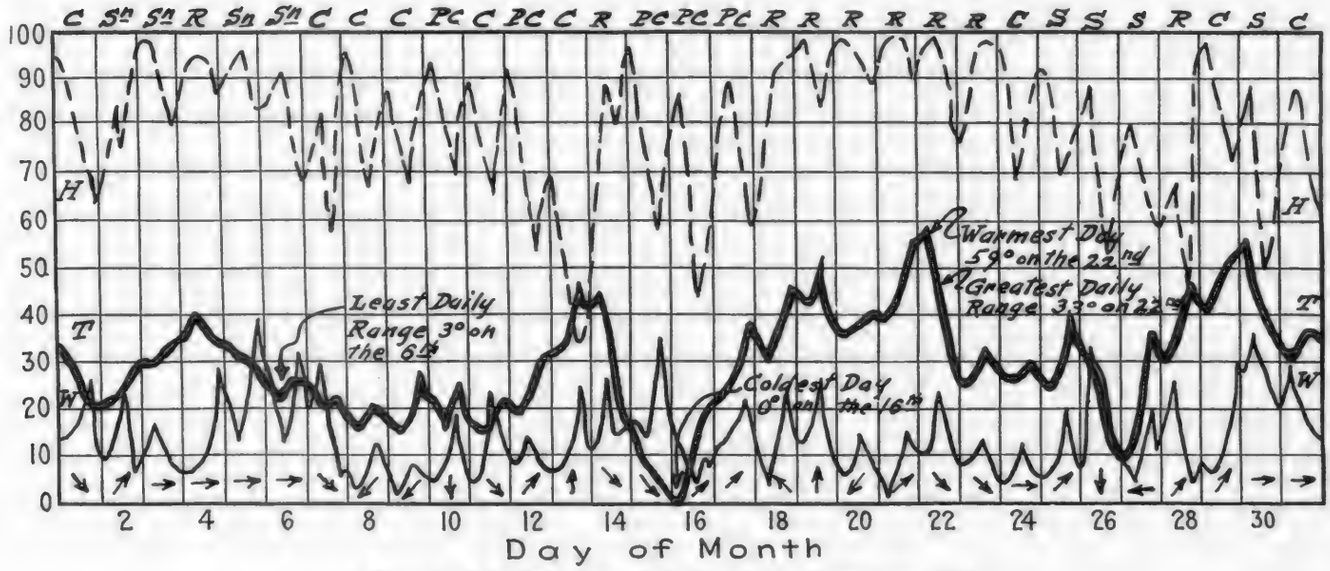
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	51	52	59	42	59
Date of highest temperature	19	29	22	4	3
Lowest temperature, deg. F.	— 1	0	0	— 9	— 3
Date of lowest temperature	27	26	16	15	15
Greatest daily range, deg. F.	33	33	33	34	28
Date of greatest daily range	26	26	22	27	27
Least daily range, deg. F.	5	4	3	3	4
Date of least daily range	21	21	6	28	18
Mean temperature for month, deg. F.	30.2	30.6	30.1	24.8	31.6
Normal mean temp. for month, deg. F.	30.9	27.8	30.5	23.7	31.2
Total precipitation, in.	1.95	2.67	3.52	1.15	3.66
Normal precipitation, this month, in.	3.79	3.82	2.87	2.00	2.27
Total snowfall, in.	5.5	16.1	6.6	12.2	1.7
Total wind movement for month, miles	14301	7966	9136	9271	9262
Average wind velocity, miles per hour	19.2	10.7	12.3	12.5	12.4
Prevailing direction of wind	N.W.	S.W.	S.W.	N.W.	N.
Number of clear days	8	10	2	5	9
Number of partly cloudy days	10	6	5	10	8
Number of cloudy days	13	15	24	16	14
Number of days with precipitation	14	12	5	9	9
Number of days with snow	4	4	6	2	4
Snow on ground at end of month, in.	None	None	Trace	Trace	None



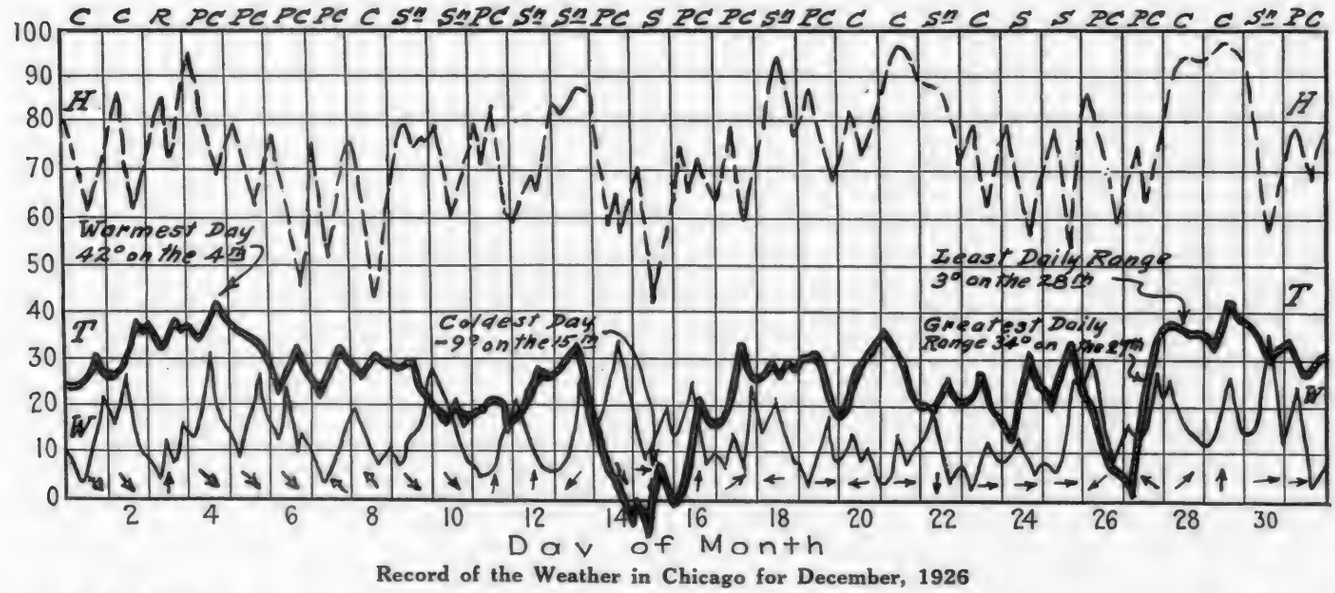
Record of the Weather in New York for December, 1926
(Hourly Observations of the Relative Humidity Plotted on this Chart)



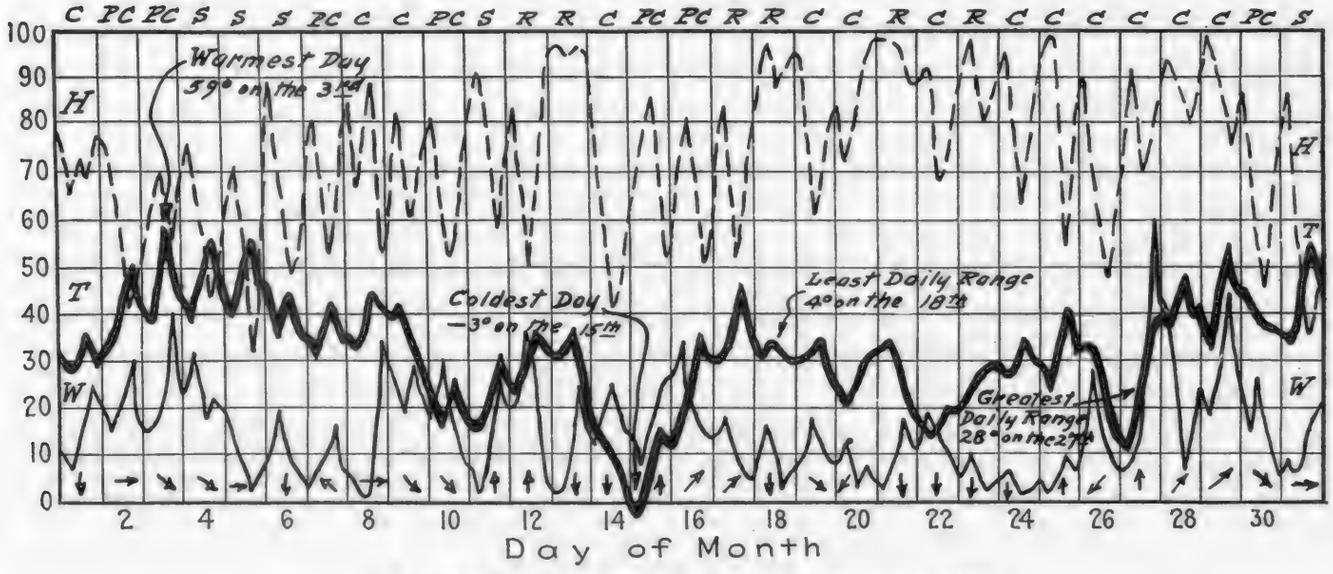
Record of the Weather in Boston for December, 1926



Record of the Weather in Pittsburgh for December, 1926



Record of the Weather in Chicago for December, 1926



Record of the Weather in St. Louis for December, 1926

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M.
S—Clear, PC—partly cloudy, C—Cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

Masonite, A Structural Insulation Material

Among the numerous insulating materials for building construction which are figuring in the present building insulation campaign is the product known as Masonite, which is produced by the Mason Fibre Co., 111 West Washington St., Chicago. This insulation is a manufactured board, made entirely from wood fibre and is featured as retaining the natural strength and composition of the wood, but is so constructed as to add to these natural characteristics a very high degree of insulating value.

In the process of manufacture of this wood product, clean wood chips are exploded under high steam pressure so that the wood is reduced to a fibrous pulp, which consists of long, cellulose a myriad of minute air cells in and between the fibres.

Masonite, it is stated, may be used as a sheathing, as a plaster base, an interior finish, a roof insulation and as a sound deadener. Heat tests made upon this board by G. F. Gebhardt, Chicago, show that the co-efficient of heat conductivity per inch of thickness per hour is 0.328 by the flat plate test and that the co-efficient of heat transmission per inch of thickness is 0.253 by the hot-box test.

The manufacturer has prepared heat loss and condensation charts for figuring roof condensation. These charts show the heat losses through various types of roofs reduced to tons of coal assuming a 5-ply, pitch-and-gravel roof, and ascertain from the chart at what temperature and humidity condensation will begin when this roof is uninsulated; it will be found that if the temperature is 70° F., condensation will begin at 40% relative humidity. The addition of one layer of insulation stops the condensation up to a relative humidity of 60%, while two layers will prevent condensation until the relative humidity reaches 80%.

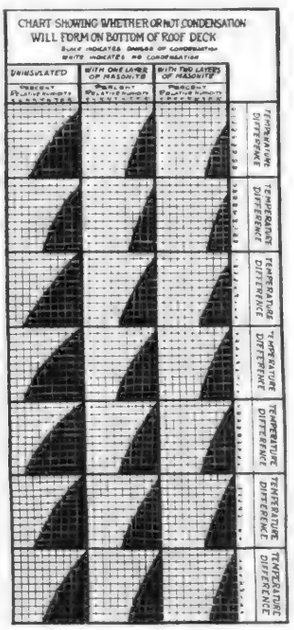


CHART SHOWING WHETHER OR NOT CONDENSATION WILL FORM ON BOTTOM OF ROOF DECK
BLACK INDICATES DANGER OF CONDENSATION
WHITE INDICATES NO CONDENSATION
UNINSULATED
WITH ONE LAYER OF MASONITE
WITH TWO LAYERS OF MASONITE
PERCENT RELATIVE HUMIDITY
TEMPERATURE DIFFERENCE

TYPE OF ROOF	INSULATION	CONDUCTIVITY -K-	PERCENT SAVING DUE TO INSULATION	HEAT LOSSES IN TONS OF COAL, PER 1000 SQ. FT. OF ROOF AREA, PER 100 DAYS AT DIFFERENCES OF TEMPERATURE SHOWN. CALCULATIONS ARE BASED ON AVERAGE HEATING VALUE OF COAL—10,000 B.T.U. AND FURNACE EFFICIENCY OF 60%									
				STEAM	VAPOR	TEMPERATURE DIFFERENCE 10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
5 PLY PITCH & G ROOF 7/8 WOOD DECK (1/2 inch)	NONE	.41		17	20.4	.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7
	ONE LAYER MASONITE	.265	38%	10.6	12.7	.44	.88	1.3	1.8	2.2	2.7	3.1	3.5	4	4.4
	TWO LAYERS MASONITE	.183	55%	7.6	9.1	.31	.62	.93	1.24	1.55	1.86	2.17	2.5	2.8	3.1
5 PLY PITCH & G ROOF 1 3/4 WOOD DECK (Soft Wood)	NONE	.305		13.	15.6	.53	1.06	1.6	2.1	2.65	3.2	3.7	4.25	4.8	5.3
	ONE LAYER MASONITE	.208	32%	8.6	10.3	.35	.7	1.05	1.4	1.75	2.1	2.45	2.8	3.15	3.5
	TWO LAYERS MASONITE	.158	48%	6.6	8.	.27	.54	.81	1.1	1.35	1.6	1.9	2.15	2.4	2.7
5 PLY PITCH & GRAVEL ROOF 2" CONCRETE DECK	NONE	.53		22	27	.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.
	ONE LAYER MASONITE	.29	45%	12	14.5	.49	1.0	1.45	2.	2.45	2.9	3.4	3.9	4.4	4.9
	TWO LAYERS MASONITE	.20	62%	8.3	10.	.35	.70	1.05	1.4	1.75	2.1	2.45	2.8	3.15	3.5
SAME ROOF 3" CONCRETE DECK	NONE	.49		20.5	24.5	.84	1.7	2.5	3.35	4.2	5.05	5.9	6.7	7.6	8.4
	ONE LAYER MASONITE	.28	43%	12.0	14.	.48	.92	1.44	1.9	2.4	2.9	3.35	3.84	4.3	4.8
	TWO LAYERS MASONITE	.20	59%	8.5	10.	.35	.7	1.05	1.4	1.74	2.1	2.45	2.8	3.15	3.5
SAME ROOF 4" CONCRETE DECK	NONE	.47		20.	23.5	.8	1.6	2.4	3.2	4	4.8	5.6	6.4	7.2	8.
	ONE LAYER MASONITE	.27	42%	11.	13.5	.46	.92	1.38	1.84	2.3	2.76	3.2	3.7	4.15	4.6
	TWO LAYERS MASONITE	.194	56%	8.	9.7	.33	.66	.99	1.3	1.65	2.	2.3	2.65	3.	3.3
SAME ROOF 6" CONCRETE DECK	NONE	.42		18.	21.	.72	1.44	2.15	2.9	3.6	4.3	5.1	5.8	6.5	7.2
	ONE LAYER MASONITE	.255	39%	11	13.	.44	.88	1.32	1.76	2.2	2.64	3.1	3.5	3.96	4.4
	TWO LAYERS MASONITE	.184	56%	7.8	9.2	.32	.64	.96	1.28	1.6	1.9	2.25	2.55	2.9	3.2
SAME ROOF 2" CONCRETE 6" HOLLOW TILE	NONE	.30		12.5	15.	.51	1.0	1.5	2.0	2.55	3.05	3.57	4.08	4.6	5.1
	ONE LAYER MASONITE	.207	31%	8.6	10.3	.35	.7	1.05	1.4	1.75	2.1	2.45	2.8	3.15	3.5
	TWO LAYERS MASONITE	.16	47%	6.6	8.0	.27	.54	.81	1.1	1.35	1.6	1.9	2.15	2.14	2.7

Mason Fibre Company's Heat Loss Table and Condensation Chart for Figuring Roof Condensation

fibres, with their strength unimpaired and with the lignins, or natural cementing structure of the wood, retained. No chemicals, it is stated, are added and the exploding process is purely a physical one, so that there is no change in the composition of the material except that it has been torn apart into its natural fibres.

Owing to the long fibre pulp, the manufacturer states that it has been found possible to fabricate a board with the natural strength and composition of wood. Masonite structural insulation, as sold on the market, is this long fibre pulp pressed into board form. The pressure is applied hydraulically until the desired degree of hardness is obtained. This makes it possible to fabricate the board in various degrees of density and pressure is applied until a point is reached, giving the proper amount of rigidity to the material but still maintaining its insulating value by leaving

per 1000 sq. ft. of surface. For example, referring to the heat loss chart can be seen that a 5-ply pitch-and-gravel roof with a 7/8-in. wood deck will have an equivalent coal loss of 2.8 tons per 1000 sq. ft. of area in one heating season, when exposed to an average difference in temperature of 40° F. and uninsulated. The same roof, insulated with one layer of Masonite, loses only 1.8 tons during the same time.

The calculations in the table are worked out for seven different kinds of roofs, for uninsulated and one and two layers of insulation. On the condensation chart, diagrams are shown indicating when condensation is liable to occur, either on the walls or roof and under the various conditions of uninsulated and one and two layers of insulation. All conditions of relative humidity are covered, with temperatures ranging from zero to 100° F.

As an example of the use of this chart,

Frank A. Holby Corporation Enters Oil Burner Field

After having acted as distributors of Aetna Automatic oil burners in the metropolitan district for several years, Frank A. Holby Corp., 4 East 40th Street, New York, has entered the manufacturing field with a heavy-oil burner adapted to industrial uses.

The corporation has purchased the Sunbeam burner patents from John T. McTarnahan of Boston, one of the pioneers in the western development of oil burning. Mr. McTarnahan has had nearly twenty years' experience in this field, and, during the last two years, has been building up an active business in eastern New England; nearly one hundred Sunbeam burners are now in successful operation.

The name of the burner has been changed to "Holby", and the corporation will actively extend its business to all sections of the country. At the same time the Aetna business will not be neglected, as seven show rooms have been opened in the metropolitan area.

The Holby Air Turbine is suitable for either 14°-16° or 28°-31° A.P.I. oil, is extremely simple and rugged in construction, and the design incorporates several novel features. As the name implies, the burner is of the "gun" type, the

Mister Hooley Goes to the Heating Engineers' Annual Meeting

With Apologies to "Mr. Dooley"

"AND did yez go t' th' convinshun, Hooley?"

"Sure and Oi did," said Mr. Hooley, "and a foine matin' it was. If yez hev the toime, O'Shaughnissy, Oi'll tell yez all about it."

"Yez ar-rouse me intherest," says Mr. O'Shaughnessy, "Oi nivir attinded wan of thim talkin' matches."

"Arrah, O'Shaughnissy, it wuz a long thrip to Sint Looey. Whin we ar-roived we nearly missed the place entoirely and had to back up t' the station. They tuk us to the Shtatler Hotil where we slept the slape o' the just. The next marnin' Oi got up falin' able to dhrive the ash wagon as will as the nixt and after a bit of a bite o' breakfast, Oi went to the matin'."

"Shure, an' wor there minny there, Jawn?" says O'Shaughnessy.

"Indade, there wor. And a foine toime they had. I nivir heard so much talk in me loife. Fir-rst one man talked, and thin another and then two o' thim tried to shpake at the same toime. Shure, if it was not for a little slidge hammer the prisident had, yez nivir would know what wuz sed."

"And could ye git th' dhrift of it all?" says O'Shaughnessy.

"Only in part, Jawn. Faith, Oi nivir knew vintilation had so minny p'ints o' view. Shure, we had air filthers, and rad-iathors and schoolhooses and hotils and th' divil knows what else. They even counted the dusht in the air. Thin they had winder vintilation and michanical vintilation and unit vintilation, whativer thot may be. Well, anny way, it wuz mighty intherestin'."

"Tell me, Jawn," says O'Shaughnessy, "it must 'a bin gra-ate to sit in the matin' hall with the vintilation in kapin' with the occasion."

"Vintilation, O'Shaughnissy? Divil a bit did they have. Every one wuz shmokin' and more than once we had to lave the matin' to git a whiff of fresh air."

"What, Jawn, yez don't mane to till me thot a matin' of vintilation engineers had anything but the best air in Sint Looey?"

"Faith and that's exactly what Oi'm tillin' ye, Jawn. That is, excipt whin they opened the winders."

"Shure, and don't thry to till me they opened any winders?"

"Thot they did, Jawn, and minny's the toime me fate got so cold Oi had to put me muffler around me nick to kape war-rm."

"And did yez larn anythin', Jawn?"

"Shure, and Oi did thot. Oi learned to kape me mouth shut and let the rist do the talkin', but they talked so much and so long on hate meters, air filthers, new rad-iators, schoolhooses and how much shtame a riser will carry that Oi got all mixed up and divil-a-bit do Oi remember now about most o' th' ar-rguments."

"But they till me the social affairs at the matin' were somethin' grand."

"Begorra, ye're right there, Jawn. The only thing Oi didn't like wuz the rule they had aginst wearin' overalls at the prisidint's dinner."

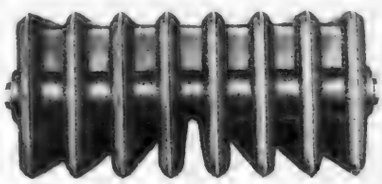
atomizing cup being driven by the blast of air through the sleeve. The oil pump and blower are mounted on a single base with the driving motor, and the strainer and relief valve are part of the same unit. A special point has been made of accessibility, and any part can be dismantled without interfering with other elements.

Boiler capacities up to 300 H.P. can be fired with a single gun; larger capacities are taken care of by multiple-gun installations.

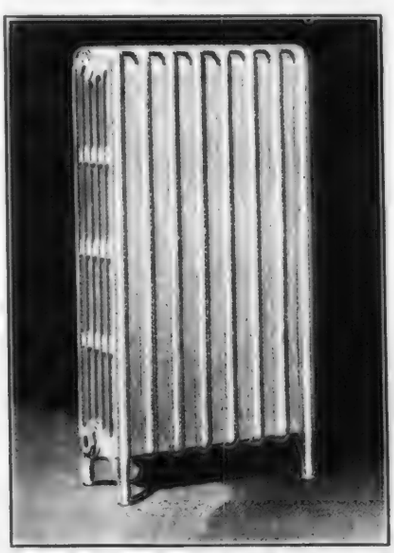
In addition to the burners installed in New England, which include nine in as many boilers in the Alden Park Manor apartments in Brookline, the largest apartments in New England, four burners have been installed on vessels of the U. S. Shipping Board. It is understood that the owners of Alden Park Manor are building a similar apartment in another eastern city, and that Holby burners have been specified.

A Unique Design of Radiator Shield

Something unique in the way of a radiator shield has been brought out by the Landon Radiator Co., North Tonawanda, N. Y. It is described as an invisible shield, due to the fact that it fits in between the sections of the radiator and has no projecting surfaces. As applied to the back of the radiator it discharges the warmed air outwards and into the room, away from the walls and hangings. Landon radiators, it is stated, can be shipped with or without shields in all heights and sizes.



Top of Radiator Showing Shield in Place



Wall Side of the Landon Radiator with the Landon Invisible Shield in Place

Welding Joints in Brass Pipe

The welding of brass pipe is coming into more general use and is overcoming difficulties previously experienced with leaky joints and the stripping of pipe threads. Welding eliminates the cutting and threading of brass pipe to fit certain exact distances between fittings and also eliminates nearly all the brass fittings as well, with the exception of valves.

The use of welding also decreases the amount of space required for the pipe. Where flanges and fittings are eliminated, partitions can be made thinner and an increased space thrown into the room. Although this saving is small on a single partition, in apartment house work it may develop into an increase in floor space of a foot in the total length of the building—an economic factor not to be disregarded.

Frank T. Chapman Located in Paris

Frank T. Chapman, at one time manager of the Vento department of the American Radiator Company, later associated with the Fitzgibbons Boiler Company as sales manager and recently specializing as a consulting marketing engineer, is now located in Paris, France, at the Cie Nationale des Radiateurs, 149 Boulevard Haussmann.

Practical Application of Fixed Differential to Vacuum Heating

C. A. Dunham Company Works Out Method of Saving Fuel Which Combines Temperature Control and Economy

HOW a matter of common knowledge may be incorporated into an improved scheme of heating is illustrated in the new Dunham differential vacuum heating system which has recently been announced by the C. A. Dunham Co., Chicago. The basic feature of this system is simply the fact that a reduction in steam pressure makes a reduction in temperature and if the pressure on the steam can be reduced below atmosphere to a point nearly approaching a perfect vacuum the radiator temperature nearly approaches the ranges commonly obtained with hot water.

Therefore it is only necessary to arrange a system in which the vacuum on the steam will be proportional to the outside temperature so as to gain a temperature control which is nearly equal to automatic control and does not have the disadvantage of opening up the radiator whenever windows are opened, which always occurs with thermostatic regulation.

In fact, the system even goes farther than this and, to a large extent, prevents the opening of windows during cold weather by holding down the temperature in the room to a point where the room is comfortable but not overheated.

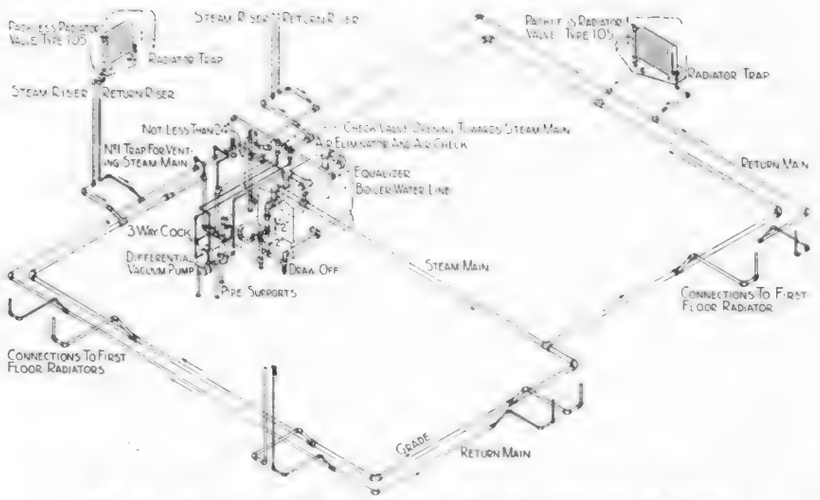


Fig. 2. General Scheme of Layout for a Complete Dunham Differential Vacuum System

It is the purpose of this article to clarify some of the doubtful points in connection with the use of a fixed differential on a vacuum system and to illustrate how such an application works out in actual practice.

At first inspection the features and principles of operation of such a system do not make a very strong appeal to the engineer, but investigations of the results attained in practical operation give a very different aspect to the subject.

First, should be taken up the details of installation and operation, after which it will be more easily understood how this system is capable of producing better controlled heating, as well as economizing on the fuel.

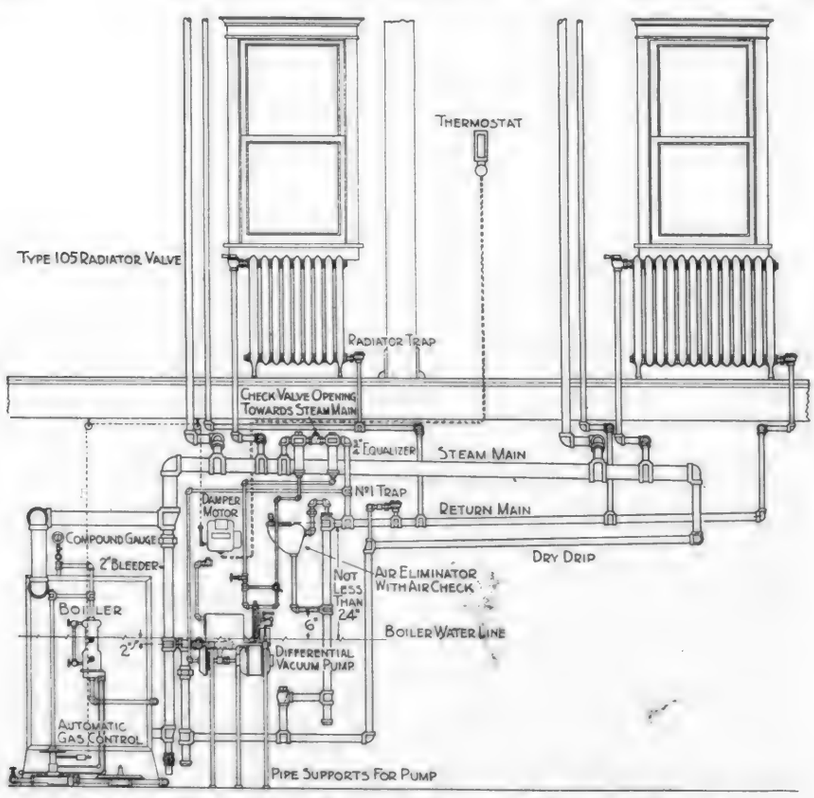


Fig. 1. Typical Installation of Dunham Differential Vacuum Heating System

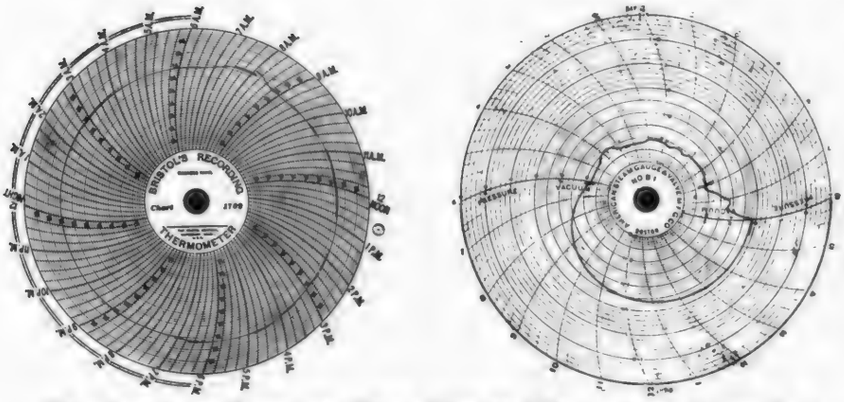
The differential system of vacuum heating (as previously stated) maintains a fixed and constant differential in pressure between the steam line and the return line. How much this difference in pressure must be is determined largely by the piping and is usually made the minimum amount at which satisfactory steam and return circulation can be secured.

For systems with the piping designed of ample area and properly pitched (in other words, systems primarily designed for use with a fixed differential) the difference in pressure may be carried down to as low as 1-in. In systems without ample pipe size and perhaps with insufficient grades on some lines (in other words, systems laid out for ordinary vacuum use) it may be necessary to raise the difference in pressure up to 5-in. or 6-in. in order to secure good circulation.

The smaller the differential is kept, the less will be the power expended in the vacuum pump to maintain this difference and the greater will be the economy in electric power consumed.

Any type of boiler, fired with any of the practical fuels, such as coal, oil or gas, may be used as a steam supply for the differential system, and the two chief devices of unusual character consist of the special vacuum pump used and the differential regulator.

The arrangement of the piping corresponds to that of the ordinary vacuum system except that slightly larger sizes are advisable with good grades on the returns to allow the differential to be kept down to a minimum. Ordinary vacuum system piping, however, can be used with equal facility simply by raising the differential to a point where the ecenomy in electric power consumed.



Figs. 3 and 4. Operating Charts Showing Effectiveness of Control in Maintaining Even Temperatures (Fig. 3) with Changes in Vacuum Necessary (Fig. 4)

To control this differential a differential regulator is used, this being built on the principle of the common boiler diaphragm regulator, except that the amount of differential maintained by the regulator is governed by an adjustable spring, instead of by a weight.

As far as the vacuum pump is concerned, this is an electrically-operated centrifugal unit capable of carrying a high vacuum on the whole system, including the boiler and steam lines, as well as the return.

On the radiators thermostatic traps which will properly function under both pressure and high vacuum conditions are required, while graduated valves are used on the radiator supply connections. A typical installation, clearly illustrating details of the piping and involving a gas-fired boiler, with control from a single thermostat, is shown in Fig. 1. A better idea, perhaps, may be gained of the general scheme of layout from the isometric drawing of a complete system, shown in Fi$_{\circ}$. 2.

At this point the reader undoubtedly wonders how all these simple features and the use of a fixed amount of differential is going to economize on the fuel and give better heating in the building. This question can best be answered by considering how the system is operated.

While in Fig. 1 one thermostat is shown controlling the gas supply to the boiler, this is not absolutely necessary and, with coal burning boilers, is seldom used. Instead, a typical room is selected as a key room and this room is kept at a constant temperature by controlling the fire under the boiler.

On a mild day, a very small fire is carried and, as the production of steam falls off, the steam in the system is condensed and a rising vacuum results. Regardless of how much vacuum is created on the steam side by such condensing, the vacuum pump always maintains just a little more vacuum in the return and this circulation is not interfered with.

Now, the increase in vacuum automatically reduces the radiator temperature and, consequently, the heat emission which, in turn, prevents overheating the rooms in mild weather. The result of this is to have all the rooms comfortable but not too warm, so that opening windows is practically eliminated. With this control, the milder the weather, the greater the saving from this source.

It might well be said that in extreme weather little, if any, saving accrues, but, as about 90% of the winter season consists of comparatively mild temperature instead of extremes, the savings occurring in differential heating are going on about 90% of the time and reach a zenith during the heating days on which the highest temperatures occur.

Estimates of the fuel consumption made by the operating engineers of buildings where differential systems have been installed coincide in the amount of fuel being saved, the figures being about 25% of the total fuel formerly burned.

As control from the system is all from the boiler room, thermostatic regulation on the radiators and even on the boiler may be eliminated. To indicate how complete this control really is, the two charts shown in Figs. 3 and 4 are interesting. These charts were taken on a day when the outside temperature averaged 54° F. and the operating engineer had been instructed to maintain 72° F. in the building all day.

Fig. 3 illustrates how close to the 72° F. it was possible to regulate and Fig. 4 shows the changes in vacuum necessary (through the medium of fire control) in order to carry this 72° F. constantly throughout the day.

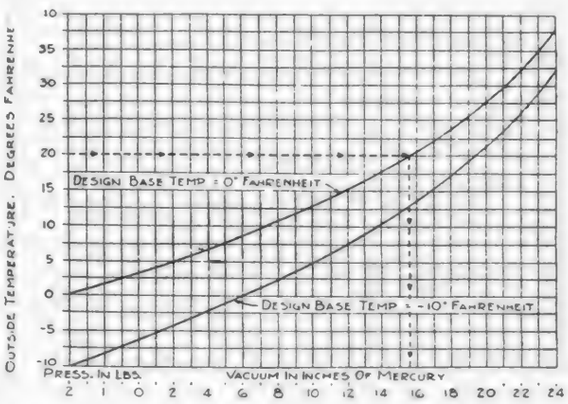
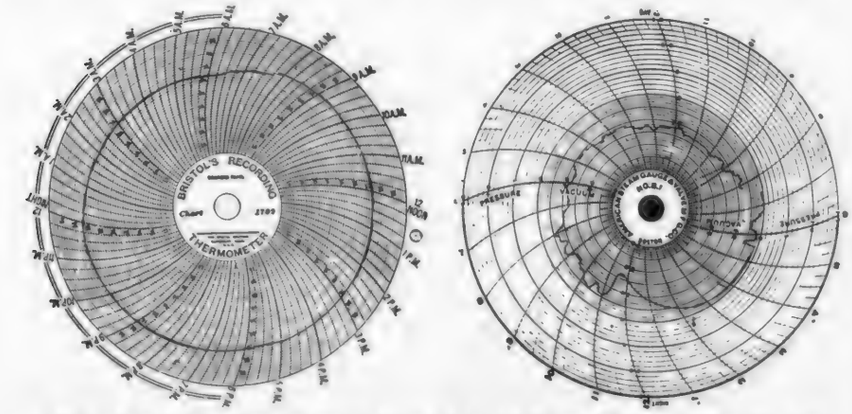


Fig. 7. Theoretical Steam Pressures for Maintaining a Room Temperature of 70° F. at Changing Outside Temperatures

Another record on a 17-story building of sixty apartments, taken on a colder day, is shown in Figs. 5 and 6, Fig. 5 being the temperature carried inside of the building (practically 70° F. except during the night) and Fig. 6 the vacuum and steam pressures necessary to carry on the boiler to hold this steady temperature when the outside weather was fluctuating around 29° F.

As a help to operating engineers, the chart shown in Fig. 7 has been worked out, this chart having two curves, one based on a minimum temperature of zero and one based on a minimum temperature of 10° F. below zero. Assuming a maximum operating pressure of 2-lbs. in extreme weather (either zero or 10° below, as desired) and locating the outside temperature on the left-hand side of the chart, a horizontal line can be run to the right until it intersects with the curves desired. Then, directly under this intersection, at the bottom of the chart, will be found the pressure in pounds or the vacuum in inches which should be carried to compensate for this particular outside temperature.



Figs. 5 and 6. Temperatures Carried in 17-Story Building (Fig. 5) with the Necessary Vacuum and Steam Pressures (Fig. 6)

Legal Decisions

Steam Heating Installation as an Extra

In an action for extra work and materials furnished in the alteration of a dwelling house, the principal question was whether the installation of steam heat and air pipes was extra, or was included in the original contract.

Specifications offered in evidence by the plaintiff paged 1 to 47 and drawings numbered 1 to 9 and 200, initialed by the parties, but containing no provision for the performance of any steam-heating work. The item "heating" has separate specifications of five sheets which were received in evidence. These formed no part of the general specifications, but were separately entitled and bound within a distinct cover as "heating specifications" and were not initialed by the parties. Plaintiff offered evidence to show that the steam heating was not included in the original specifications on which he figured. Defendant offered proof to show that plaintiff was under no misapprehension when he sent the architect a list of subcontracts totaling the exact contract price, including an item of plumbing and heating, that heating was included in the general contract, nor when he made requisitions for part payment including similar items.

The New York Appellate Division, L. Seletzky Co. v. Ehrlich, 218 N. Y. Supp. 605, held that under this conflicting evidence the question whether the charge for steam heat and air pipes was an extra, as claimed by plaintiff, and ordered to be done by defendant as such an extra, or was a part of the work originally contracted for, was one for the jury. It was also held reversible error to exclude the plans for steam heating and defendant's testimony as to whether plaintiff initialed any such plans and to refuse to permit reference to parts of the general specifications referring to drawings and specifications for steam heating work.

Construction of Option to Return Cooling System

A cooling system was sold to a purchaser on the installment plan, who had it installed in premises which he occupied under a lease. The contract of sale which was in writing, contained the following clause, "It is further agreed that you may give back this equipment to us two years from date, and we have hereby agreed to pay the sum of $2,700 for the entire equipment."

The only question in an action by the buyer, who recovered in the trial court a judgment for $2,250, to be paid out of the proceeds of the property was whether this clause was so clear and explicit that it needed no interpretation. The seller admitted that plaintiff would have been entitled to judgment if he had returned or tendered the return of the equipment to defendant two years from the date of the contract; but it contended that, as the plaintiff's lease terminated, and the equipment was tendered to defendant several months before the expiration of the two years, the action, under the terms of the contract, should be dismissed. The trial court, over the objection of the defendant, admitted oral testimony to show the intention of the parties with regard to the quoted clause. The objection was urged on the ground that the provision was unambiguous, and needed no interpretation, and it could not be varied or altered by oral testimony.

The defendant's contention was that the contract fixed a definite and specific date on which the return of the equipment should be tendered; but counsel for the defendant admitted in his argument that a tender within a reasonable time after the expiration of that date would be a compliance with the contract. The Louisiana Supreme Court, Pilsbury v. Typhoon Fan Co., 110 South 96, was of opinion that this admission was conclusive of the fact that the words "two years from date," as they appeared in the contract, called for an interpretation of those terms and required the introduction of proof to show the intention of the parties to the contract, and therefore the trial judge correctly ruled that oral testimony was admissible for that purpose. The court found it unnecessary to review the oral testimony admitted, because all of it, including the testimony of the defendant's president and salesman, showed that it was the intention of the parties that the plaintiff could return the equipment at any time within two years from the date of the purchase.

Obligation of Landlord to Furnish Heat

In a suit for temporary injunction by the tenant of restaurant premises in the theatre district of New York City to restrain the landlord from shutting off the steam heat at 11 P. M. each night, the tenant relied upon a provision in the lease that the landlord "would furnish steam heat to warm the halls, stores and basement stores between the 10th day of October and the 1st day of May in each year without additional charge to the tenant; but inasmuch as no additional rent is charged for such heat, the landlord shall not be liable for any failure to supply the same."

The New York Appellate Division, reversing an order denying the motion for injunction, Columbus Spa vs. Star Co., 216 App. Div. 218,215 N. Y. Supp. 653, said that in seeking for the intention of the parties to the contract, the fact that a construction contended for would make the contract unreasonable might be properly taken into consideration; and the intention of the parties should be gathered from the entire instrument. The court cited the case of Berlinger vs. Macdonald, 149 App. Div. 1, 133 N. Y. Supp. 522, where it was held that, notwithstanding the fact that there was no covenant in the lease that the landlord should supply the necessary heat to keep the apartment warm and comfortable, he was nevertheless obligated to do so. Such a covenant the court said would be read into the lease. By an express provision in the lease the defendant was bound to use the apartment leased only for a private dwelling for himself and his family. He could not so occupy it unless artificial heat were furnished in cold weather.

The court also cited Halperin vs. McCrory Stores Corp., 207 App. Div. 448, 202 N. Y. Supp. 385, affirmed 239 N. Y. 547, 147 N. E. 189, where it was held that a clause providing that: "The landlord agrees to furnish such heating to the demised premises as the plant at present installed will provide," required the landlord to furnish the necessary heat to keep the building warm.

Several rules of construction warrant this conclusion. The first is that the intention of the parties, taking into consideration the surrounding circumstances, must govern. It is reasonable to assume that under all the circumstances the landlord intended to heat these premises so that the tenant might successfully operate a restaurant, bearing in mind the location of the restaurant and the requirements of the neighborhood. That is all that the tenant seeks to have done. Secondly, if there is any ambiguity in the clauses of the lease, although we do not believe there is, the tenant is entitled to the benefit of a construction most favorable to him. In addition, however, these parties are bound by a practical construction of this lease, for the reason that during part of the first winter the landlord, recognizing the responsibility, furnished sufficient heat to conduct the restaurant business in conformity with the surrounding circumstances, taking into consideration the neighborhood where the restaurant was located.

"It is not for the landlord to determine when heat shall be furnished, nor to give his own construction of a written instrument. The landlord must abide by that construction which will best effectuate the intention of the parties when the lease was made. The landlord here says there can be no damage if it fails to give heat and then contends that equitable relief should not be given for the reason that plaintiff has a remedy at law and may collect damages for the failure of the landlord to perform the contract. There is a clause in the lease which expressly provides that there shall be no damages for failure to furnish heat and this case, therefore, is peculiarly one for equitable intervention."

The motion for an injunction was granted.

Grates for Burning Small-Sized Anthracite

Previous articles in this series are as follows:

1.—*Neemes, October*, 1926.
2.—*Johnson, November*, 1926.
3.—*Rath, November*, 1926.
4.—*Pyramid, December*, 1926.
5.—*Culm-Burn, December*, 1926.
6.—*Atlas, January*, 1927.
7.—*Spencer Heater, February*, 1927.

8. Grieve Grates

AMONG the various types of grates used for burning the cheaper sizes of anthracite coal should be mentioned the Grieve grate, manufactured by the Combustion Engineering Corp., 43 Broad St., N. Y. These grates are designed not only for anthracite use but will burn a wide variety of both hard and soft coals.

Grieve grates are made in dumping, shaking and stationary types and are designed by the manufacturer so as to operate with either natural or forced draft, being composed of a special grade of grey iron.

The *dumping grate* is constructed with two side frames, with one or more center frames if the width of the furnace is sufficient to make additional supports necessary.

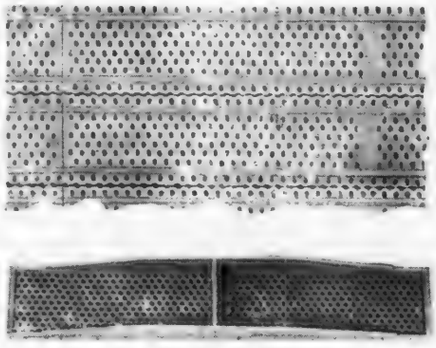
Front and rear frames also are provided, supported on legs or extended into the side walls of the furnace; a cross trunnion bar is used to carry the grates, this being locked into the side frames by means of a wedge and protected from the action of the fire. The grates adjacent to the side bars prevent the wedges working out sideways, while the shape of the socket, or trunnion bar bearing, does not permit their working upward.

Owing to the construction whereby the grates are secured to the trunnion bars by bolts, an interlocking arrangement results which makes it impossible for any grate to jump out of its proper position. Reinforcement is arranged on the trunnion bar at the bolt holes, as well as on the ribs fitting over the trunnions. To eliminate warping and twisting, which sometimes occurs with long bars, the lengths of the trunnion bars are limited to 24-in.

With the *stationary grate* design the grates are supported on two or three cross bars (depending on the length of the furnace) and, if the grate is placed under a wide boiler, supports for the cross bars are provided in order to prevent breaking or sagging. A rib is also cast on either side of the grate units, so arranged as to permit the hoe used in cleaning the fires to ride along the top of the rib, thus leaving a thin film of ashes over the top of the grate. This rib serves a double purpose of protecting the grate from intense heat and also stops particles of green coal from falling through the grate.

Shaking-style grates consist of short bars, not over 24-in. long, each section having a heavy rib through the middle and several cross ribs to insure against warpage.

The sections of the shaking grates are so arranged that the number of units on



Top and Bottom Sides of Grieve Grate Bar

a shaker bar will not be difficult to operate and so that too large a section of the fuel bed will not be disturbed at one time. A connection is made between the shaking lever and a link which, in turn, is connected to the shaking arm cast on each unit.

One feature of this grate, to which the manufacturers attach great importance, is the use of elliptical holes for air passage. The shape of these orifices is circular at the bottom and they taper to an oval at the top. It is asserted that an elliptical orifice will not permit as free a passage of coal through the grate as a circular orifice of the same area.

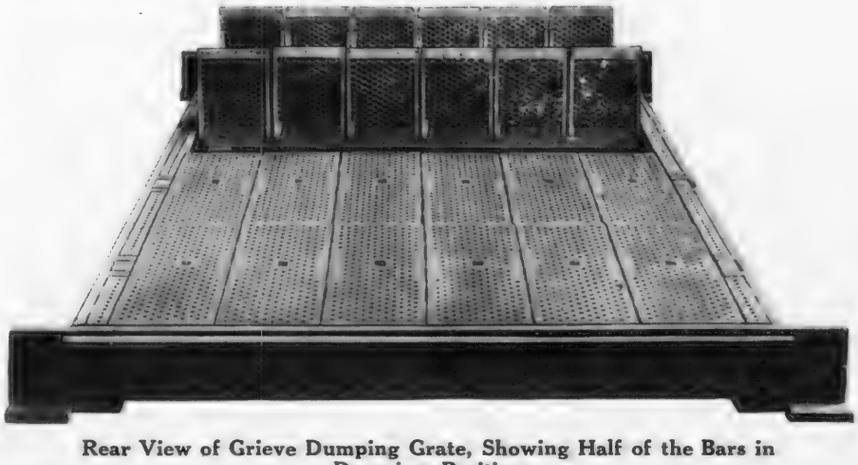
Construction of Spencer Heater

In connection with the description, in last month's issue, of the Spencer steel tubular heater and its adaptability for burning small-sized anthracite, the statement was made that "the heater, of steel tubular construction, has two cast-iron headers or sections—one forming the front of the boiler and the other the rear."

This statement was made in error, as both headers or sections are of steel. The sections are connected together by fire tubes and water tubes, the fire tubes running inside of the water tubes. The inside shells of both the front and rear sections are provided with large openings, into which 4-in. steel water tubes are expanded, forming a rigid connection between the two sections. Near the top of each section is a 10-in. steam dome, which provides sufficient steam-generating space.

In the outside shells, opposite the large holes of the inner shells, are smaller holes 3 in. in diameter, into which the fire tubes are expanded so as to form a second rigid connection between the two steel sections.

McKee Feed Water Devices are described in a folder issued by Eclipse Fuel Engineering Co., Rockford, Ill. The output of this company consists mainly of an automatic feed-water regulator, a low-water fuel cut-off and a combination of the two. The last combination is designed for gas-fired boilers, to cut off the fuel supply in case the water in the boiler gets exceptionally low. An interesting feature of the feed-water regulator is the soft-metal valve seat which is so located that cold water passes the valve before it encounters the hot water from the boiler. This construction is used because, where hard water is fed to the boiler, lime is usually precipitated when it enters the hot water and this usually takes place around the regulating valve if one is used. By keeping the hot water from the valve, this objection is eliminated.



Rear View of Grieve Dumping Grate, Showing Half of the Bars in Dumping Position

New Apparatus and Appliances

Massachusetts Modified Unit Heater

A modified type V unit heater has been announced by the Massachusetts Blower Division of the Bishop and Babcock Sales Co., 4901-4915 Hamilton Ave., N. E., Cleveland, O. A complete description of this heater is included in its bulletin No. 55 which also supplies much engineering data in connection with the altered type of heaters.

In construction this heater may be described as having two standard Massachusetts modified squirrel-cage fans mounted on the same shaft, these fans being operated by motors of standard manufacture, with double shaft extension for direct connection with the fans. The starting switches are mounted on the side of the heater casing.

Exterior and Interior Views of Massachusetts Type V Modified Unit Heater

Radiation used consists of Massachusetts unit heaters furnished in three, four or five tubes in depth and in one or two sections, depending on the size of heater and the requirements of the installation. The heater is built of heavy ¾-in. brass tubes, each tube being wrapped with a thin copper radial fin in a helical form, these fins being tinned to the tubes, the ends of the tubes being rolled into holes in the tube sheet and the whole section tested at 200 lbs. hydraulic pressure. The heaters are designed to operate on any steam pressure up to 100 lbs. gauge.

The air filter consists of filter cells of standard manufacture which are fitted into the unit and are removed without difficulty for cleaning.

To complete the unit the whole assembly is encased in an annealed steel casing mounted on a rigid structural steel frame and fitted with an access door and removable side panels. Lace pattern steel grilles are provided for distributing the air in three or four directions as desired.

Trane Double-Capacity Heat Cabinets

Largely because of a demand for individual heating units that will be equivalent to 100 sq. ft. or more of direct cast-iron radiation, The Trane Co., La Crosse, Wis., announces a double-capacity heat cabinet which is essentially two standard heaters joined together and placed in one cabinet.

It has been found that while there is considerable objection to increasing the length or height of a radiator or of its cabinet, there is practically no objection to increasing the width and, in this case, the cabinet is made 13-in. in over-all width. It is found that many installations are required under windows where a single unit 28-in. high would not have sufficient capacity. With the new style double-capacity heat unit, a 26-in. radiator, rated at 114 sq. ft., can be obtained, with a 56-in. over-all length. Such heat cabinets are readily utilizable as seats when placed in front of windows. With this in view the cabinet has been made considerably stronger and will stand a weight of several hundred pounds without sagging. Heat cabinets of this type are available in 20-in., 26-in. and 30-in. heights and in various capacities from 34 sq. ft. to 140 sq. ft.

Bernhard Smokeless Boilers Embody New Ideas

Discarding entirely all conventional methods of designing sectional cast-iron boilers by placing the sections one behind another, the Ironton Bernhard Boiler Co., Ironton, O., announces a line of cast-iron sectional boilers made in 72 sizes with steam ratings from 600 sq. ft. to 21,000 sq. ft. and equivalent water ratings. In this new boiler the sections are placed side by side, the basic idea being to maintain the same ratio between flue area and grate area regardless of the number of sections used.

The design of the sections is such that the hottest gases come in contact with the surfaces backed by the hottest water, and the outgoing gases transfer to the return water. The breeching is at the bottom of the rear of the boiler. The products of combustion rise and impact directly against the crown sheet, then turn and pass to the rear of the boiler, with the crown sheet above and a water leg below. They then bend toward the front of the boiler and are swung downward and to the rear, where they leave the boiler at approximately the same point where the water return enters. In this way, the hottest gases are matched against the hottest water and

Design of Bernhard Triple Combustion Smokeless Boiler

the coolest gases against the water returning to the boiler. An air intake that introduces preheated air just below the crown sheet is provided for each section, so that the auxiliary air is proportioned to the grate area. It would seem that the scrubbing action of the gases would result in high rates of heat transfer in this boiler. The water-line is low and there is only 2 in. of water over the crown sheet. It is interesting to note that the plant in which these boilers are built is so situated that raw materials, pig iron, coke and sand are all produced within a mile from its location.

Tag-Mono-Duplex Automatic Indicator and Recorder

In the description of this device appearing in THE HEATING AND VENTILATING MAGAZINE for December it was stated that no electricity, water, steam, or air was required as a motive power. To avoid any misundertanding in regard to the motive power it is desired to add that this recorder is mechanically driven by an electric motor and does utilize electric current to the extent of operating the motor, even though not in the device iself.

Fleisher Accessible Air Ducts

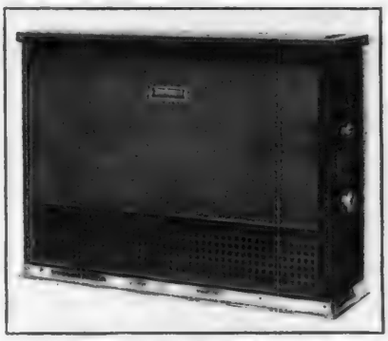
In the past, many enemies of fan and duct ventilation have pointed out that pipes used for ventilation purposes will become foul in time and collect considerable deposits of dust and dirt which either remain in the lines or, if the air current is strong enough, are blown out into the rooms.

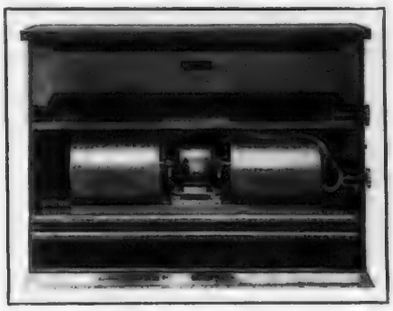
In bakery work it was found that such conditions really existed, except that the dust particles consist of fine flour which adhere to the inside of the duct and in time the duct becomes moldy and offensive.

To meet this objection, The Cooling and Air Conditioning Corp., 31 Union Square, New York, has evolved a design of duct which has a removable cover for use on Fleisher-Sturtevant bakery systems. This cover, which is made in sections, may be detached, and the interior portion of the duct cleaned at any desired point, without stopping the operation of the system.

Another feature is the arrangement of the ducts to be built into the wall instead of projecting out into the room, thus bringing the removable covers flush with the wall surface. These ducts are covered by U. S. Patent, dated May 26, 1925.

Typical Installation of Fleisher Built-in Air Ducts





Exterior and Interior Views of Sturtevant Unit Ventilator

Sturtevant Develops Line of Unit Ventilators

With a view of combining beauty and simplicity with good engineering, the B. F. Sturtevant Co., Hyde Park, Boston, Mass., announces the Sturtevant unit ventilator, which is particularly notable for its paneled front, the polished cove around the base and the nickel-plated outlet grille. Care has been taken in the design to locate the fans and motor at the bottom of the unit where the motor rests on a solid base and where it cannot become affected by the heated air or by radiant heat from the steam coil.

Pressed steel is used in the construction of the casing with a view of securing light weight. The outlet grille is placed in the top of the unit, while the inlet grille is in front at the bottom. Included in the unit is an air filter of the adhesive type.

Two multivane fans are mounted on the shaft extensions of a motor to drive the air through the unit. There is a diffusion chamber above the fans, with a radiator of brass, having extended copper surface, a by-pass for heating all or any part of the air, as desired, and a mixing chamber. The outlet directs the air in a vertical direction.

The Sturtevant unit ventilator is built up in five major units, all complete and independent of the other parts.

In a catalog devoted to this new product, detailed instructions are given for the design of a Sturtevant unit system, a table of capacities with different entering air temperatures, a typical specification and several pages of installation details. (Catalog No. 344, A.I.A. File 30-d1).

Buffalo Forge Hi-Pressure Unit Heaters

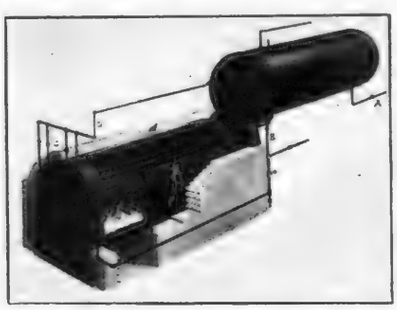
As the result of two years of designing and testing, Buffalo Hi-Pressure unit heaters have been placed upon the market by the Buffalo Forge Company. These heaters embody several ideas that are emphasized by the manufacturers. The heating coils in the unit are made of ½-in. steel pipe bent to shape by special tools designed for this work. They are assembled in staggered rows between two extra-heavy steel headers using a specially designed, leak-proof connection at each end of each coil. The heaters are then tested under hydraulic pressure. With this design, pressures as high as 150 lbs. per square inch can be used, by virtue of which a high heat transfer per unit heater can be obtained. Buffalo Conoidal-type fans are used, giving a high efficency. The heater can be furnished with one, two or four-way discharge openings as desired. One feature emphasized is the ruggedness of the design, the coil unit being practically

non-breakable. The headers themselves are made of 4½-in. extra-heavy steel pipe and the fittings for connecting this pipe to the header are turned from solid steel. The unit may be supplied with flexible coupling and motor sub-base for direct connection, or supplied with connections for mounting motor when of the belted type. The steam and drip connections may be made at either end of the heater, and any arrangement of the discharge connection may be had, as the local conditions may demand. Double fan units are used in all units. At present four sizes are available, having 720, 1120, 1960 and 2360 lin. ft. of ½-in. pipe, respectively, and requiring 1 to 7½ H.P.

"BST" Submerged Water-Heater System

When steel boilers are used for heating, as in apartment houses, schools, institutions and similar buildings, a method of heating water for domestic service is possible which is a little out of ordinary practice.

This scheme which is known as the "BST" submerged heater system, manufactured by Ferguson & Lange Foundry Co., 1039 Willow St., Chicago, involves the insertion of heating units in the boiler just below the water line and above the crown sheet.



Typical Installation of "BST" Submerged Water Heater System

These heating units are connected to circulation pipes running from the bottom of the adjacent hot-water tank to the top so as to store the heated water in the tank ready for service.

Adoption of this device does away with the necessity of maintaining a separate fire to heat water for domestic service during the winter months.

Clarage Crown Ventilator

What is termed a ventilator of improved design with larger capacity has recently been placed on the market by the Clarage Fan Co., Kalamazoo, Mich., under the name of the Crown ventilator. The unit is constructed entirely of pressed steel, with the exception of the cast-iron base and damper shaft. Top, front and back are solid and air is delivered through the ends only. This design is used for the purpose of preventing drafts and also hinders refuse and dirt from entering the ventilator, owing to the absence of direct openings to the floor.

Clarage Crown Ventilator

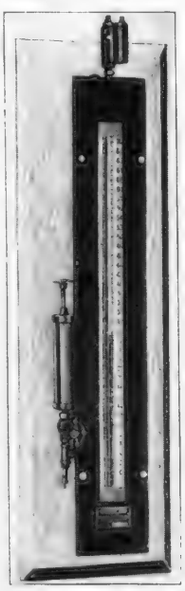
In size the ventilator is manufactured in one design only, with the proportions arranged to fit under either the opera or church type of seat, and quantity of total air flow is determined by the spacing.

Individual air flow from each ventilator also is controlled by means of a damper, rotated on a shaft. This damper may be set by inserting a screw driver or similar tool through the louvred openings and moving the damper to the desired position.

The Oilmetre

A device without mechanically-moving parts, springs or floats, for indicating the level of oil or any other liquid in storage, has been brought out by the National Oil Gauge Co., Chicago, under the name of the Oilmetre. The standard Oilmetre will indicate up to 5000 gal., but it may be calibrated to any capacity.

This gauge can be located at any distance from the tank either above or below it. Installation is made by mounting the gauge on the wall and running a single ¼-in. tube to the tank. The instrument consists of a column mounted in a suitable housing and connected to a pump and outlet which is piped to the storage tank.



Oilmetre for Indicating Level of Oil or Other Liquid in Storage

In the arrangement of this instrument the point is made that no part of the gauge comes in contact with the liquid it measures, there being a connection between the meter and the liquid. This connection is made of lead, steel, copper or glass, according to the liquid measured.

The Oilmetre has two scales, one showing the actual liquid level in the tank, and the other, the scale graduations, depending upon the dimensions of the tank. The gauge is entirely air-operated. If desired, one gauge may be used for two or more tanks.

$2000.00 in Prizes for a Name

Two thousand dollars in prizes is offered by the L. J. Mueller Furnace Co., Milwaukee, Wis., and by the Richardson & Boynton Co., New York, who are eastern distributors for the manufacturer, for a name for its new gas-fired boiler, now known as the Gas-Era.

$2000 is Offered for a Name for this Boiler

The new boilers are of the cast-iron sectional type, with a burner unit for each section. They are built in sizes from 400 sq. ft. to 12000 sq. ft. of steam capacity, and equivalent sizes for hot water. The ratings are in accordance with the American Gas Association standard; that is to say, on the basis of 240 B.T.U., available at the boiler outlet per square foot of steam radiation. With this rating, it is recommended that a boiler be chosen with 50% capacity in excess of the net standing radiation. A feature of the boiler is a burner unit adjustable in height so that any kind of gas may be efficiently burned.

The manufacturer emphasizes the fact that the vertical surfaces of the unit in this boiler are smooth and offer no support for the collection for the fine particles of dust that form the principal accumulation in the flues of most gas boilers. Provision has been made for easy cleaning through the clean-out openings on the top of the boiler without disturbing the jacket. The adjoining surfaces on each unit are surface-ground so that air-tight connections are secured through proper installation.

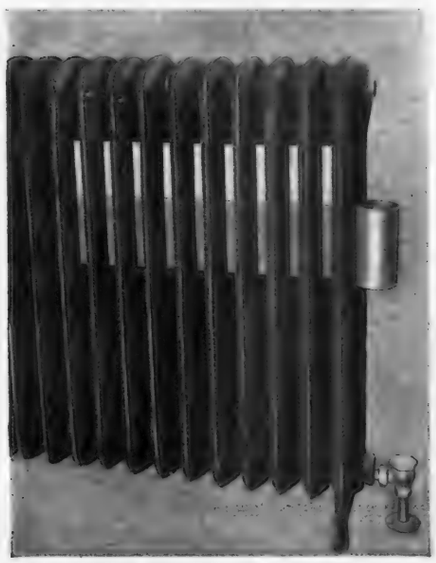
New Trade Publications

ELGIN WATER SOFTENING EQUIPMENT is described in a catalog received from Reiter Co., Elgin, Ill. The function of this system is to supply soft water to steam boilers. The Elgin system utilizes the heating of the water to its boiler temperature to precipitate the hardening element which through the use of a neutralizing agent is separated into suspended or removable form.

The separated solids are carried by thermo-siphon circulation to an outer precipitator where they are collected and drawn off at intervals with a negligible loss of boiler water.

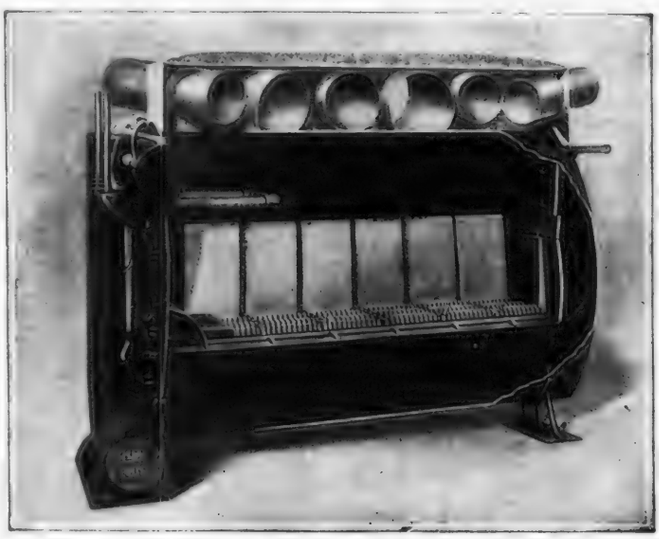
The catalog contains a number of diagrams showing the system applied to various types of boilers.

WINTER AIR MOISTENERS are described in a small circular issued by Crane Co., St. Paul, Minn. These moisteners consist of small cup-like containers with thin extensions in which are placed sheet-asbestos wicks. The extension to the water container is pushed between the radiator columns so that it rests on the cross bars. It is held in place by its own weight, requiring no fastening devices. The water poured into the container is carried along the bottom of the asbestos wick and by capillary attraction is drawn up the height of the wick, thus exposing a large moist surface to the heated air as it passes through the sections of the radiator. The container holds about two quarts of water which, under normal conditions, can be evaporated in 24 hours. It is recommended that one unit be used for each 25 sq. ft. of water radiation in the home or office, and one for each 50 sq. ft. of steam radiation in homes, apartment houses, schools and office buildings. As many as 8 units can be used with each large steam radiator.



New Type of Radiator Air Moistener

SUCCESSFUL HOUSE HEATING is the title of an interesting piece of literature, describing Keystone coil boilers, being circulated by the Keystone Boiler & Fdry. Co., Landisville, Pa. These boilers are of the round type, with annular water-spaces. Spiral water-tubes or coils constructed of wrought-iron pipe are so nested above the combustion-chamber space as to absorb a large amount of the available heat in the products of combustion. Due to the shape of the coils a rapid water-circulation is secured in them and the deposition of sediment is prevented. These boilers have been manufactured for upwards of 35 years and the statement is made that the average cost of repairs has averaged less than 50c per boiler. The catalog contains a number of illustrations of boilers installed in residences and public buildings, with letters from the owners in each case testifying to satisfactory operation. One illustration shows one of the present-day boilers that replaced a smaller one which had been in service for 32 years. The old boiler was returned to the factory and, after being rebuilt, using the old material, was again put in service in a garage. A letter from the original owner states that for 20 years he operated this boiler without expending a cent upon it for repairs. Keystone coil boilers are made in 19 sizes. Size 5 in. x 8 in. Pp. 40.

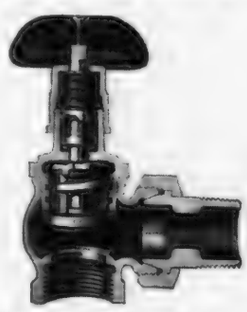


Keystone Coil Boiler

"GRATE VAIREA" is the intriguing title of a little booklet being sent out by the Weil-McLain Co., Michigan City, Ind. The sub-title on the cover is "What It Is—Its Effect on Grate Area." The argument advanced in the text is that the actual grate area in a boiler is not of as great importance as the effectiveness to which each unit of grate area is worked. "Grate area," says the booklet, "means the area of grate surface. 'Grate Vairea' means variation of the amount of air passing through different parts of the area of a grate."

"Grate Vairea" is caused by the variation of the volume and the velocity of draft passing through the grate at various points. It is found, to a certain degree, in practically every boiler. An interesting series of illustrations in two colors leads up to the presentation of the argument that the design of the Weil-McLain boiler avoids "Grate Vairea." It is stated that the result of this design means long firing period without attention, and simplicity of firing. It also makes the boiler adaptable for any grade of hard or soft coal, coke, lignite or oil. The smokeless feature is also incorporated in this boiler.

CAPITOL STA-PAK is the trade name of a new line of packless radiator valves described in a circular issued by the Capitol Brass Works, Detroit, Mich. This line includes a hot-water valve, and steam valves of the modulating type in all required sizes. The valve has an extremely high lift and is opened or closed by one turn of the handle. The packing is inserted under pressure and held in place by means of a brass washer which is under the tension of a sturdy spring. It is stated that the valve will not leak around the stem and will not require repacking.



Capitol Sta-Pak Packless Radiator Valve

INSTANT STEAM WATER HEATERS are described in a circular issued by Instant Water Heater Sales Division, Inc., 332 South Michigan Ave., Chicago. This heater consists of concentric steam and water chambers with a copper spiral baffle in the outer water-chamber. The chambers are so arranged that the cold water entering the heater passes through the central chamber the full length of the heater, surrounded by steam which is confined in the second chamber. The water then returns spirally in a thin sheet along the outside wall of the steam chamber, absorbing, in its travel, all possible latent heat of vaporization. Instant heaters are made in a number of sizes having capacities from 65 gal. to 1950 gal. per hr. with inlet water temperatures of 32° F. and any temperature rise up to 180° F.

COMMONWEALTH INSERTS are described in a catalog received from Commonwealth Electric Co., St. Paul, Minn. These devices are for use in concrete ceilings from which pipe is to be hung. When the forms for the ceiling are in place, the insert is driven into the form until the spur on the side is firmly imbedded in the wood. The concrete is then poured, and when the form is removed, the lower part of the insert is left projecting below the lower surface of the ceiling, while the head is firmly imbedded in the concrete. Any kind of pipe hanger can then be readily attached to the insert.

Kennedy Valve Mfg. Company Fifty Years Old

A notable landmark has been reached by the Kennedy Valve Mfg. Co., Elmira, N. Y., by its completion of fifty years of business life. The business was founded in 1877 by Daniel Kennedy, who is still the president and in active charge of the Kennedy organization. This unusually long and uninterrupted continuity of ownership and management has been an important factor in the development and growth of the Kennedy business to its present position.

After successively outgrowing the four-story building in New York City in which it was started, and a much larger plant at Coxsackie, N. Y., the company moved, in 1907, to Elmira, N. Y., where it now occupies two large plants, covering a total of 35 acres.

The development of the Kennedy Valve Mfg. Company from its beginning has been closely identified with engineering progress in the various fields which it has served. It was perhaps the first to recognize the advantages of gate valve design, and its educational efforts and many successful installations played a large part in winning general acceptance of this type of valve in the service for which it is adapted. In the entire history of the company, it is stated, not one of its designs has ever had to be recalled, and in many instances, it designed and manufactured valves for operating conditions that had been pronounced impossible to meet. Its outstanding success in this type of work helped to build up a national reputation for the company.

To-day, the Kennedy line covers a large range of valves for standard and special requirements, as well as pipe fittings and fire hydrants.

American Radiator Boilers for Oil Burning

Engineers and heating contractors will be interested in the impetus being given to oil burners and oil burning by the American Radiator Company, as shown by the company's recent national publicity on this subject. The advertisement, "Best Oil-Burner Results," which appears on this month's front cover, is being published, likewise, in national family magazines with a total circulation of upward of ten million.

As the company states, the new line marks the application of existing types of American Radiator boilers specifically to oil as a fuel, rather than any basic changes in design. The new models represent the result of much experimentation conducted at the company's Thermal Institute in Buffalo, where for years scientific studies have been made in the interest of public health and comfort, as they relate to heating and ventilating.

An official of the American Radiator Company is quoted as having said, recently: "Apparatus pertaining to the burning of oil as a heating fuel, developed over the last few years, and rapidly brought to a state of high efficiency in recent times, conclusively proves that oil burning has a very definite place of its own in the field of heating.

"In certain localities and certainly under some conditions, which there is no necessity to enumerate, oil burning may come to be recognized as having distinct advantages.

"However, to reach its greatest state of efficiency, oil burning must experience two favorable factors: first, complete and proper combustion of the oil, producing a maximum of heat and, second, the burning oil must be surrounded and encased in a boiler specifically constructed with a view to extracting from the burning oil the maximum of heat."

In order to establish definitely the requirements involved in adapting coal-burning boilers to oil burning, the company carried out a program of research, during which all inventors and engineers interested in the production of oil burners were invited to Buffalo, where the company's laboratories were put at their disposal and their own engineers collaborated.

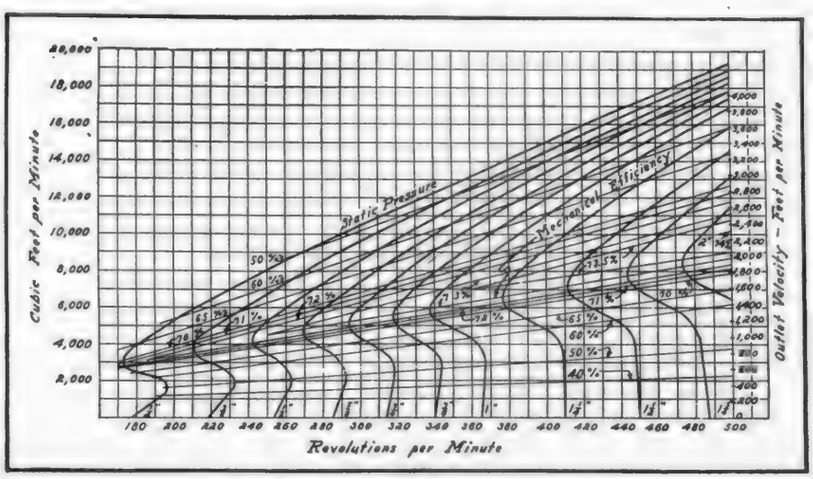
The company states that numerous installations have since proved in practice that the standard set for Ideal boilers are being maintained in this specific field. This is attributed largely to the construction characteristics of Ideal boilers whereby water passages surround the fire chamber.

The Ideal Type A heat machine, too, the company states, has been found to lend itself, through special application, to the use of oil as a fuel, its own particular features making it adaptable to those types of burners which produce flames which completely fill the combustion chamber.

From the Type A heat machine down the line to the company's well-known Arco round boilers and the little Arcola, research and service tests have demonstrated their adaptability to oil burning with the desired degree of efficiency.

University of Kentucky Type ME Fans

In the description of the test on the type 31 ME Fan, manufactured by the New York Blower Co., Chicago, Ill., and given on page 109 of THE HEATING AND VENTILATING MAGAZINE, for February, reference to a chart and curves is made. The chart referred to is here shown and gives the performance at each static pressure from ¼-in. to 2 in. By this means the most efficient point of operation for each pressure is brought out very clearly.



Performance Curves of Type ME Fan

Swartwout Company and "S-C" Regulator Mfg. Company Consolidate

The Swartwout Co., of Cleveland, manufacturers of power-plant equipment specialties and factory ventilating systems, and the "S-C" Regulator Mfg. Co., of Fostoria, O., have joined forces under a consolidation which took place February 1. The new company is to continue under the name of The Swartwout Company, headquarters to be in Cleveland at the factory address, 18511 Euclid Avenue. The Fostoria plant of the "S-C" Regulator Mfg. Co. is to be discontinued, the equipment being moved to the factory buildings of The Swartwout Company in Orrville, O.

J. M. Barrett D. K. Swartwout D. K. Swartwout, Jr.

D. K. Swartwout, president of the company bearing his name, continues as chief executive of the merged company, while J. M. Barrett, executive head of the Fostoria firm, becomes a vice-president. D. K. Swartwout, Jr., also continues in an executive capacity, being vice-president and general manager. W. E. Clement is secretary and treasurer, and L. P. Russon, assistant sales manager.

The Swartwout Company's line includes steam, oil, and air separators, factory ventilating systems, low-pressure float, boiler-return, lifting and float traps, as well as cast-iron exhaust heads and feed-water heaters and purifiers. Metal insulated ovens are also an important item in its list of products. The "S-C" line, developed over twenty years, includes pump governors, feed-water regulators, valves for special regulating, differential pressure, high-pressure relief and differentials for electrically-driven boiler-feed pumps, and, in addition, special drainage control systems.

D. K. Swartwout, the leading figure in bringing the two factors together, has to his credit many basic patents, upon which his company and those he has been identified with during his life have built their products. In his early days in the industry, he was connected in a sales capacity with B. F. Sturtevant Co., of Boston, manufacturer of ventilating systems.

As designing engineer for the "S-C" Regulator Mfg. Company, Mr. Barrett has designed and supervised installations of equipment for many large power plants in leading cities of the United States.

All products are to be distributed under the trade marked brand "Swartwout and 'S-C'."

American Radiator Company Takes Over Excelso Specialty Works

Announcement is made by the American Radiator Company that it has taken over the business of the Excelso Specialty Works, Inc., of Buffalo, N. Y., manufacturer of the Excelso line of indirect water heaters. The company further announces the appointment of Cecil W. Farrar as president of the new subsidiary.

The Excelso heaters were developed by C. P. Wadley, and have met with pronounced success from the time they were first placed on the market. Until the purchase of the firm by the American Radiator Company, Mr. Wadley was its president and Mr. Farrar, vice- president.

Early in Mr. Farrar's career he was employed by the American Radiator Company at the Pierce plant in Buffalo, and later in the company's sales branch in that city. He was afterwards connected with the United States Radiator Corporation and was for four years manager of its Buffalo, branch, which he opened. He then became vice-president of the Excelso Specialty Works.

Mr. Farrar was twice president of the Western New York Chapter of the A.S.H. & V. E.

E. H. Ruppert will continue as eastern representative of the Excelso Specialty Works, with headquarters in New York, and R. E. Moore will remain western manager, with headquarters in Chicago.

RADIATOR BRACKETS is the title of a booklet by the Frank Radiator Bracket Co., Chicago, Ill. This catalog covers radiator brackets, expansion hook plates, hook plate offsets, coil spreaders and hangers, as well as toggle bolts and pipe hangers. Size 4 x 8 in. Pp. 16.

Death of Dr. Jesse T. Duryea

Dr. Jesse T. Duryea, president of the Pierce, Butler & Pierce Mfg. Corp., New York, and the Wolff Mfg. Corp., Chicago, died January 30, while en route to California, where he had planned to spend the winter.

Dr. Duryea was 62 years old. Long before he became identified with the heating and plumbing industries he had risen to a position of prominence in the medical field, having been at one time superintendent of the Kingston Avenue and Kings County Hospitals, in Brooklyn. He had also served as general medical superintendent of hospitals in Brooklyn and Queens, under the New York City Department of Public Charities.

In 1913 he became associated with the Colwell Lead Company. When that company was merged with the Pierce, Butler & Pierce Corporation, in 1917, he was made president of the merged companies. Later on he was also elected president of the Wolff Corporation and a director of the By-Products Coke Company.

During his administration both companies prospered greatly. At the time of his death they comprised six large manufacturing plants, with 3000 employees.

It is announced that Roger Morton, formerly treasurer of the Pierce, Butler & Pierce Mfg. Corporation, and a son-in-law of Dr. Duryea, was selected as the new president of that company at a meeting of the directors, February 16. At the same time I. N. Beeler, formerly vice-president, was elected chairman of the board of directors and C. F. Bennett, secretary, was elected a director. Other officers of the company are: Vice-presidents, H. E. Longwell, J. C. Gaskill, William J. Woolley and Philip J. Flaherty; assistant secretary, Martin R. Bush; and controller, A. N. Theobald.

Death of J. F. Branen

J. F. Branen, for a number of years distributor of S. T. Johnson Company oil burners for the state of Wisconsin, died suddenly in Helena, Mont., late in January. Mr. Branen was on his way home from a visit to the Johnson factory in Oakland, Cal., and had stopped in Helena to take charge of an exhibition. His western trip was largely necessitated by failing health, due to strenuous work during the last two or three years, during which time he built up a remarkably fine dealer organization in his territory. Mr. Branen was one of the most successful and popular of the Johnson distributors.

FREDERICK B. MUELLER, first vice-president of the Mueller Co., Decatur, Ill., whose death occurred January 5, was for more than twenty-five years field manager of the sales force of the Mueller Company, and had an important part in the development of the company's sales field. He was 64 years old.

Present Accepted Practice in Domestic Oil Burners

27—Sundstrand. *Nozzle Atomizer, Mechanical Draft, Electric Ignition*

Previous articles in this series are:

1. *Kleen Heet, July*, 1925.
2. *Baker, July*, 1925.
3. *Kerrihard, July*, 1925.
4. *Silent Glow, August*, 1925.
5. *Aetna, August*, 1925.
6. *Caloroil, September*, 1925.
7. *Oil-O-Matic, September*, 1925.
8. *Chalmers, October*, 1925.
9. *Hart, October*, 1925.
10. *Sun, October*, 1925.
11. *Rayfield, November*, 1925.
12. *A. B. C., November*, 1925.
13. *Electrol, December*, 1925.
14. *Grant, January*, 1926.
15. *Nu-Way, January*, 1926.
16. *Wayne, February*, 1926.
17. *May, February*, 1926.
18. *Ray Rotary, March*, 1926.
19. *Super Oil Heator, May*, 1926.
20. *Nokol, July*, 1926.
21. *Johnson, August*, 1926.
22. *Arrow, September*, 1926.
23. *Safe Fire, October*, 1926.
24. *Sword, November*, 1926.
25. *Hardinge, January*, 1927.
26. *Petro, February*, 1927.

27—Sundstrand

THE Sundstrand oil heat generator, manufactured by the Sundstrand Engineering Company, Rockford, Ill., is a radical departure from almost every other conventional type of oil burner on the market, despite which it incorporates no freakish parts or elements.

It employs a combustion pot, but instead of introducing the oil-gas to the fire through the bottom or sides of the pot, the oil is sprayed, in atomized form, from a point just within the fire-door, down into the pot, which is thus a target for the oil spray.

Air for combustion is introduced through the sides of the fire-pot and, moving upward by virtue of its velocity, forms a cushion for the cone of atomized oil which, of course, has been changed from its atomized form into a gaseous form before its impact with the air. As a swirling motion is given to the air in the pot, and in view of the high-pressure air with which the oil is atomized, and which forms part of the spray from the nozzle, the mixing of the oil and air is very complete. As later detailed, just enough air is blown through the nozzle to atomize the oil. Ignition is initiated a little below the nozzle, and progressive combustion marks the progress of the oil-gas down to the fire-pot where the bulk of air is encountered, and here the combustion is practically completed. By thus elongating the combustion action, much of the noise is avoided.

SLOW-SPEED MOTOR DRIVES FOUR-CYLINDER COMPRESSOR AND FAN

A ¼ h.p. repulsion-starting single-phase motor, running at 1165 r.p.m. is connected, through a flexible coupling, to a low-pressure fan furnishing air for combustion, and, through a worm-gear drive actuates a four-cylinder air compressor, furnishing air at from 10 to 15 lbs. pressure for the atomizer nozzle. A spiral-gear oil pump is also directly driven from the motor shaft.

The blast tube extends through the ash-pit door to the fire-pot and a drain pipe from the bottom of the fire-pot returns to the outside part of the burner unit, emptying into an enclosed oil safety-switch drip bucket.

The atomizer nozzle is mounted on a special fire-door to which is also attached the ignition unit, consisting of a special spark gap and a high-voltage transformer.

An oil strainer of large capacity is a part of the intake line and forms an integral part of the burner unit.

The oil pump is composed of two spiral gears, each integral with its shaft. The pump has a capacity of 1 gal. per minute, with a suction lift of 10′ when pumping against a head of 15 lbs. A relief valve, adjusted to 10 lbs., is inserted in the line between the pump outlet and the atomizer nozzle, and all excess oil is returned to the tank.

THE ATOMIZING NOZZLE AND FIRE-POT

A special door-plate is used in order that a definite relation may be established between the atomizing nozzle and the spark gap. An inspection door is also incorporated in the door plate. This plate is mounted on a pipe which acts as a duct from the fan housing to the ignition unit, providing a low-pressure flow of air to keep the spark plug cool and free from carbon. The atomizing

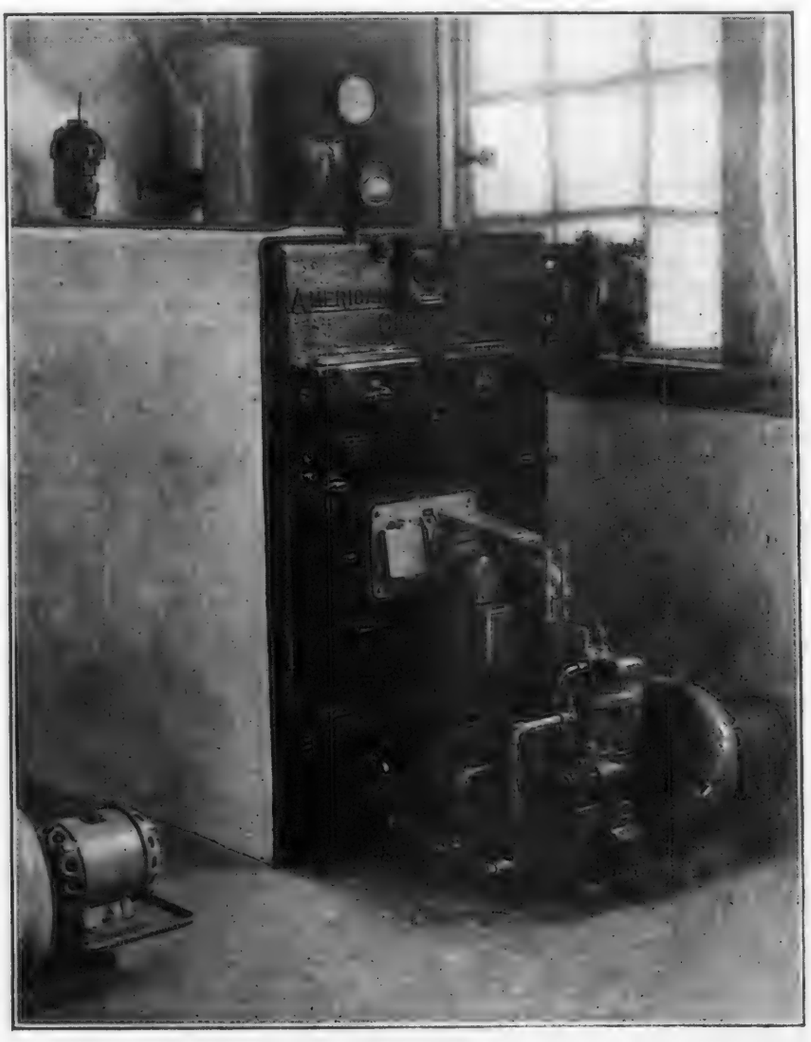
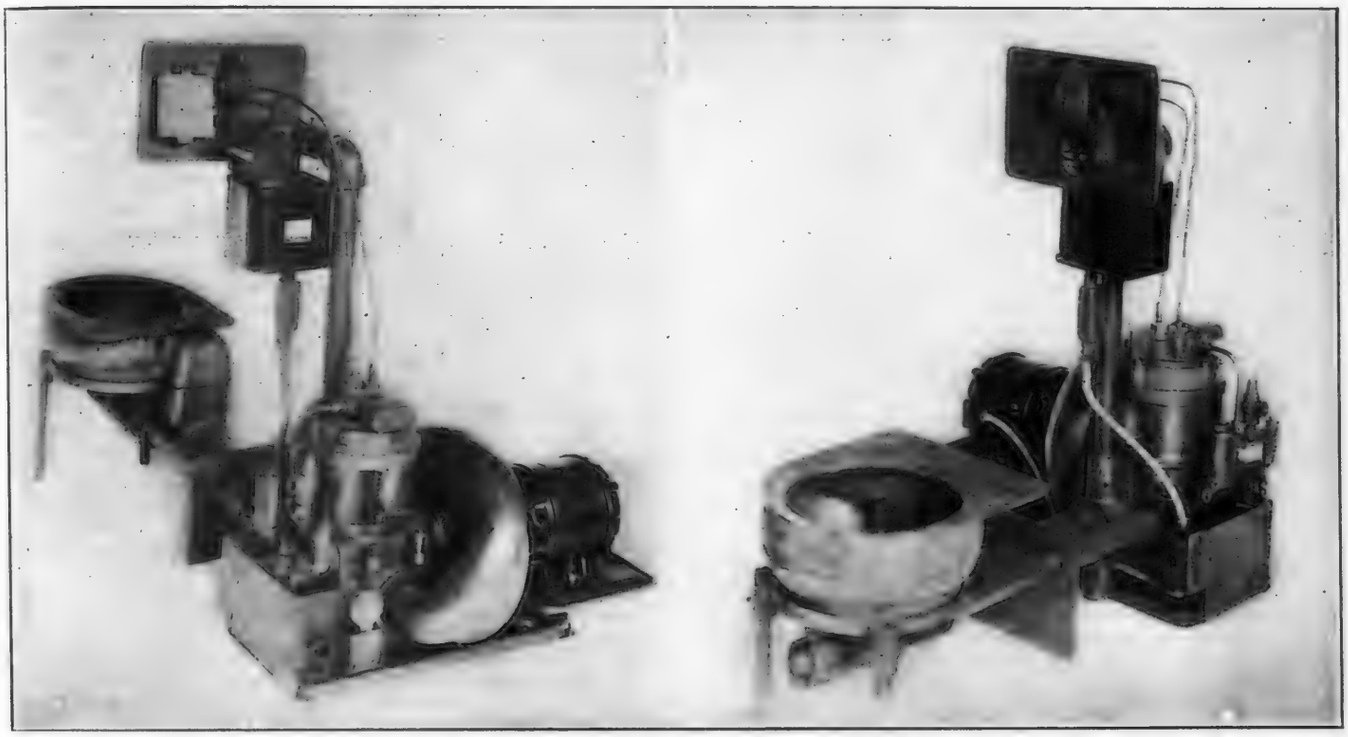


Fig. 1. Typical Installation of Sundstrand Burner



Figs. 2 and 3. (At left) the Sundstrand Burner Unit, Showing Motor Driving Low-Pressure Blower and Four-Cylinder Air Pump Furnishing Air for Atomization. (At right) the same Unit, Showing Relation Between Combustion Chamber and Atomizing Nozzle

nozzle is so mounted on the door plate that the nozzle is outside of the combustion chamber, the atomized oil-spray being injected through a small hole in the plate.

Oil is taken from the pump to the nozzle through a copper tube at a pressure of approximately 10 lbs. per sq. in. Air from the four-cylinder pump at the same pressure is piped to the nozzle casing through a copper tube, and, entering the casing is ejected in a conical spray around the oil jet. The angle of the jet is approximately 45° downward; when the burner is installed the relationship between the nozzle and the fire-pot is so established that the spray is centered in the pot. A round fire-pot is used for circular boilers and for warm-air furnaces, and a rectangular pot for sectional boilers. The rectangular bowl is lined with fire brick. The bowls are so mounted on adjustable stands that they can be properly installed in any boiler or furnace.

Fig. 4. The Special Fire Door Plate Used for Installation of Sundstrand Burner

IGNITION

Ignition is secured by means of an electric spark jumping a ¼ in. gap just outside of the cone of atomized oil; the force of the spray blowing past the ignition points draws the arc into the cone, initiating gasification and combustion. Thus the points are, at all times, outside of the flame area. A straight step-up transformer, from 110 to 8000 volts, is used. The spark-gap assembly is

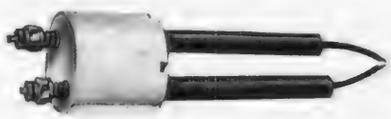


Fig. 5. Detail of Spark Gap Assembly

made up of a large heat-resisting porcelain insulator, through which passes two ½ in. steel rods having extension tips of 3/16 in. nichrome wire in the ends, with a spring at the outside end of each rod providing for expansion when the rod becomes heated. The ignition is "on" all the time that the burner is in operation, thus preventing "puffs" or "flare-backs," should there be any irregularities in the oil supply. Provision is made to prevent interference to radio reception.

THE AIR PUMP

Atomizing air, at 10 lbs. pressure, is provided by a four-cylinder piston pump, the four cylinders being arranged in two pairs, side by side. The pistons are actuated by a face cam which is driven from the motor shaft by a worm gear. The piston rods, which are fixed to the pistons, are held against the face of the cam by springs. The rotation of this cam provides an air pressure that is almost entirely free from pulsation. The cylinder heads are composed of a single valve-plate which contains intake and exhaust valves and ports. The intake valves are on the under side of the plate; the exhaust valves on the top. The former are flat steel springs; the latter are leather. A relief valve, placed in the head of the exhaust section, maintains a constant air-pressure of 10 lbs. by passing excess air into the intake section.

LUBRICATION

The Sundstrand burner uses the splash system of lubrication and all moving parts run in a bath of lubricating oil. The gear case of the burner unit is filled with lubricating oil, and a

Fig. 6. Detail of Four-Cylinder Air Pump

sight gauge is provided so that oil may be maintained at the proper level.

CONTROL

A Series 10 Minneapolis thermostat and control system is used, a Series 10 relay being interlocked with a hydrostat, pressurestat, or, for a warm-air installation, a hydrostat installed in the leader running to the living or dining room.

OIL SAFETY SWITCH

The oil safety-switch of the Sundstrand burner is a tilting pan to which a drain pipe from the fire bowl carries any unburned oil. The tilting of this pan, when it has received a given amount of oil, opens a circuit in a mercury tube which is attached to the pan, this tube being in series with the motor circuit. When the pan has been emptied and replaced in its rack, a weight on one end automatically tilts it in such a way that the motor circuit is again completed through the mercury tube.

MAGNETIC OIL VALVE

For installations where the top of the tank is above the level of the atomizing nozzle, a magnetic valve is furnished. This is a needle valve, held closed by gravity, and opened when the motor is running, as its magnetic circuit is wired in parallel with the motor.

The Sundstrand burner is listed by the Underwriters to burn oil not heavier than 32° A.P.I., with not less than 100° flash point. It is one of the first burners to be listed for label service, so that each burner will bear the mark of the Underwriters' approval.

It is designed for loads not exceeding 2000 sq. ft. of steam radiation, or its water equivalent.

U. S. Chamber of Commerce Acts to Eliminate Unethical Business Methods

The broad question of costly trade abuses and unethical business practice was the subject outlined at a meeting of the National Trade Relations Committee of the U. S. Chamber of Commerce, held in Chicago, December 3.

A program was outlined which has for its object the ultimate self-regulation of American business. The plan proposed contained practical methods for the formation, within the various trades, of joint trades relations committees composed of manufacturers, wholesalers or jobbing houses and retailers.

The scope of the program is defined in the resolution that "the purposes and efforts of the National Trade Relations Committee and Joint Trade Relations Committee shall be confined to the abatement of such unethical practices as are not contemplated by the Federal Trade Commission, and as are not generally regarded as illegal."

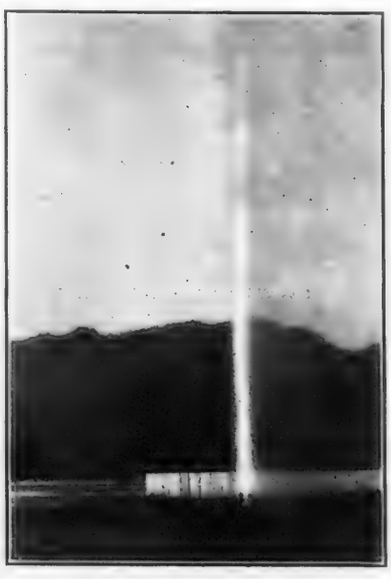
The joint trade relations committee, the active unit in the national program, is described in the tentative plan as "a committee representing a particular merchandise-group, for the purpose of arriving at (1) a common understanding of the problems originating in the dealings between manufacturers and wholesalers; manufacturers and retailers; wholesalers and retailers; (2) practical methods for the abridgment of commercial misunderstandings and disputes."

Methods by which committees may accomplish the collection and investigation of trade abuses were mentioned and means described "whereby complaints of practices may be collected, compared with each other, and acted upon."

It was pointed out that "there is a reasonable expectation that an individual who has indulged in a trade abuse is likely to repeat it. Experience has shown, for example, that a man who cancels his orders will not confine himself to one firm, but will be discovered doing so with others. If the abuse is commonly practiced by any establishment the fact appears very clearly."

Another Hot Water Geyser in California

Hot water free is the interesting feature of several wells now operating in California, some of which have been described in recent issues of THE HEATING AND VENTILATING MAGAZINE. The geyser here shown, near Calistoga, California, was discovered in 1915 while boring for cold water. After going down 180 ft., a reservoir of hot water was tapped from which streams of mingled hot water and steam rose to a height of 150 ft. to 200 ft. in the air, the temperature being about 212° F. The well spouted at intervals of about two hours.



This Geyser in Calistoga, Calif., Spouts Hot Water 200 Ft. in Air

Since then nine other wells have been put down in the so-called "hot water belt", a few of which have been capped and the water used for commercial purposes. Some of the newer wells spout more frequently than the first and the hot water is collected and used in the various bathing establishments as well as in some hotels.

At Myrtledale Hot Springs, a popular resort, located a short distance from Calistoga, not only employs the hot water throughout for heating, but has gone further and has supplied all of the private bathrooms with sulphur water which one of the wells produces.

The hot water belt extends along the northern part of the city and many of the private homes have had pumps installed by means of which they are supplied with hot sulphur water the entire year.

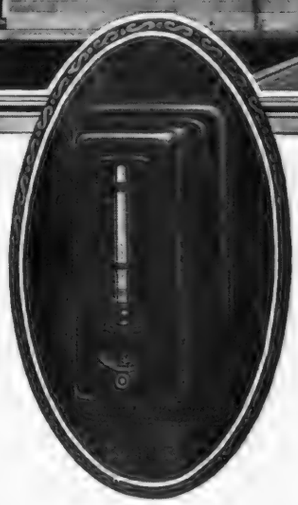
HANDBOOK ON HOUSE HEATING BY GAS is issued by Bryant Heater and Mfg. Co., Cleveland, O. In form it is especially designed to fit into the back of the new handbook on House Heating With Gas issued by the American Gas Association. This booklet contains detailed information regarding the line of Bryant gas boilers and specialties and specifications for this equipment. Size 8½ in. x 11 in. Pp. 16.

NOKOL SPECIAL SALES BULLETIN, issued February 1, tells of progress of dealers in the Nokol special sales contest. It is stated that the present leader, A. F. Collins, Decatur, Ill., took the lead by selling nine burners in one week. This contest is being watched by Nokol dealers with all the interest that attaches to a world series.

WISE OWNERS AND WINTER BUILDING is the title of a circular being sent out by the Philadelphia Building Congress of which Knickerbacker Boyd is president. The circular contains a number of photographs of buildings being constructed during the winter season and is designed to stimulate winter building.

ECONOMY GRATES AND EQUIPMENT is the subject of a booklet put out by the Economy Grate and Equipment Co., Inc., 410-412 East 34th St., New York. The apparatus described is a combination of a special grate with forced draft and draft regulation and is specially designed for burning cheaper grades of fuel such as No. 13 buckwheat coal, coke breeze, screenings, dust or culm. Savings in fuel are claimed up to $8.00 per ton over the cost of ordinary sizes of coal. The grates consist of water-cooled grate bars 4-in. wide and 3-in. deep, with vertical semicircular grooves extending from the top to the bottom. A sealed ashpit is used into which air is forced by a motor-driven blower, and an automatic regulating damper is located in the air duct to control the air delivery. Size 5½ in. x 8 in. Pp. 12.

KANSAS CITY LIFE INSURANCE CO., HOME OFFICE BUILDING.
Architects: WIGHT & WIGHT
Consulting Engineer: WALTER E. GILLHAM



THE POWERS
VAPOR DISC
THERMOSTAT

Gives true GRADUAL CONTROL. Uses only 10% of compressed air used by other Thermostats. Gives 20 to 30 years of ACCURATE control without frequent repairs or adjustments. Costs more. Is worth more!

"The Best Costs Less in the End"

ONE of the show places of Kansas City is the new office building shown above. Upon entering it, one is impressed by its symmetry, excellence of design, solidity, and its rugged appearance of durability. Here is a building which will LAST.

Inside, the quality of the mechanical equipment is in keeping with the building itself. In selecting Powers Regulation to control the temperature in this building, the Architect and Engineer have provided their client with a system which gives 20 to 30 years of ACCURATE and DEPENDABLE control without the frequent adjustments, repairs, and "SERVICE" bills which so often come with lower *first cost* systems of regulation.

Our Book, *"The Elimination of Heat Waste,"* contains ample evidence to support the above claims. May we send you a copy?

THE POWERS REGULATOR CO.

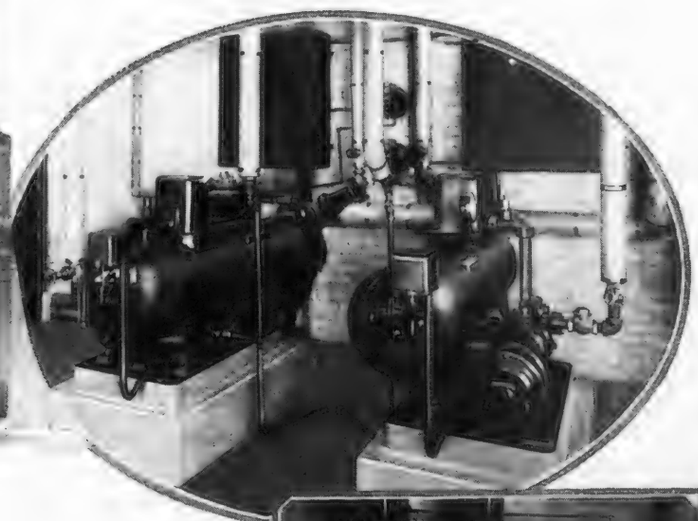
36 years of specialization in temperature control

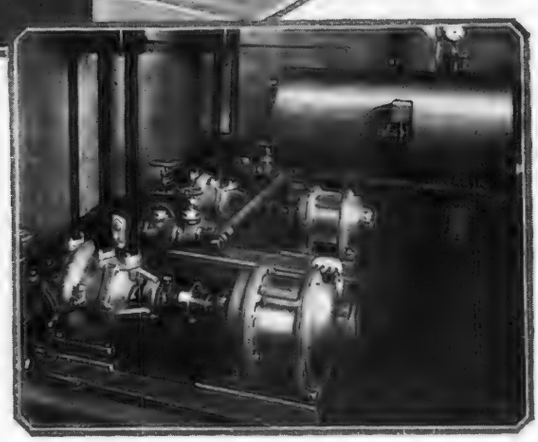
2718 Greenview Avenue, Chicago

Atlanta	Cincinnati	Houston	Minneapolis	Pittsburgh	San Francisco	Seattle
Baltimore	Cleveland	Indianapolis	Nashville	Portland	CANADIAN OFFICES	
Boston	Denver	Kansas City	New Orleans	Rochester	Toronto	Winnipeg
Buffalo	Des Moines	Los Angeles	New York	St. Louis	Montreal	Calgary
Butte, Mont.	Detroit	Milwaukee	Philadelphia	Salt Lake City	Halifax (3806)	Vancouver
Charlotte, N. C.	El Paso					

At left—Liberty Title and Trust Company Building, Philadelphia, Pa. Dennison & Hirons, architects, New York, N. Y. Riggs-Distler Co., heating and plumbing contractors, Baltimore, Md.

Below—Motor-driven Jennings Heating Pumps, in the Liberty Title and Trust Company Building.





For good heating, at the farthest radiator, in zero weather

Like other modern buildings of this kind, the Liberty Title and Trust Company Building in Philadelphia comprises many floors. A large number of rooms must be heated. And all heated equally well—the one nearest the boiler as well as the room farthest away.

Jennings Pumps make this possible. By promoting free unrestricted steam flow *throughout* the heating system, Jennings Pumps bring to each radiator its proper share of the heat and do so at substantial economies in boiler fuel, attendance, and power.

NASH ENGINEERING COMPANY

So. Norwalk Connecticut

BRANCH SALES OFFICES

UNITED STATES: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Tampa, Washington, D. C. CANADA: Montreal, Toronto and Vancouver. EUROPE: London, England, Norman Engineering Co. Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co. Oslo, Norway and Stockholm, Sweden, Lorentze & Wettre.

Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Coming Events

March 14-19, 1927. Second National Heating and Ventilating Exposition at Twelfth Regiment Armory, Columbus Avenue, 61st to 62nd Street, New York.

April 2-9, 1927. Chicago Seventh Annual Own-Your-Home Exposition, Coliseum, Chicago, Ill.

April 5-7, 1927. Annual convention of American Oil Burner Association, in Buffalo, N. Y.

May 9-12, 1927. Thirty-first annual meeting of the National Fire Protection Association in Chicago, Ill.

May 17-20, 1927. Eighteenth annual convention of National District Heating Association in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

June 1-4, 1927. Thirty-eighth annual convention of the Heating and Piping Contractors National Association in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

Miscellaneous Notes

Aluminum Bronze Manufacturers' Institute has been organized with headquarters in Washington, D. C., for purposes of research. The member companies are:

American Metal Products Co., Milwaukee, Wis.

Buffalo Bronze Die Cast Corporation, Buffalo, N. Y.

Duriron Company, Dayton, O.

Hills-McCanna Company, Chicago, Ill.

The Michigan Smelting and Refining Company, Detroit, Mich.

The director of the institute is W. M. Corse. The new organization has taken quarters at 810 Eighteenth Street, Washington, D. C. Through co-operative advertising, research and development the institute plans to establish the reputation and increase the use of aluminum bronze as a reliable, first-quality engineering material.

Building Operations for January in the 37 States east of the Rocky Mountains amounted to $384,455,400, according to the F. W. Dodge Corporation. These States include about 91% of the total construction volume of the country. This was the second largest January total on record, although 16% under the maximum January, which was last year. The entire decrease of last month is accounted for in a drop in New York City's contract volume, and two-thirds of the decrease is accounted for in the fact that January, 1926, had a single fifty-million dollar power plant for New York City, which was not duplicated in last month's record. Comparing last month's total with that of December, 1926, shows a decrease of 28%. It should be noted that this is again a comparison with an abnormally high month, the December total having been swelled by large subway and other public works projects.

The more important items in last month's building and engineering record were: $167,866,300, or 44% of all construction, for residential buildings; $80,115,700, or 21%, for commercial buildings; $58,954,700, or 15%, for public works and utilities; $27,875,300, or 7%, for industrial buildings; $17,012,500, or 4%, for educational buildings; $10,417,200, or 3%, for social and recreational projects; and $9,157,900, or 2%, for religious and memorial buildings.

Contemplated construction projects were reported for these 37 states to the amount of $755,762,600 during January. This was a 17% decline from the amount reported in December and a 11% decrease from the amount reported in January of last year.

In New York State and in northern New Jersey the contracts let amounted

Every User a Satisfied One!

Read These Actual Statements
about
AUTOVENT UNIT HEATERS

From a Factory Engineer:—

"This equipment has been in service for about two months and it is operating very satisfactorily.

"While we have not made any technical tests upon its efficiency, we are quite sure that it is fulfilling all we expected it to do."

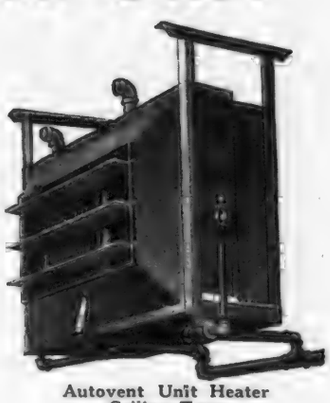
From Another Factory Owner:—

"We are so very much pleased and satisfied with it, that there are no words which could express how much we appreciate this heater.

"We will always recommend your heater to any of your future prospects."

And, from a Heating Contractor:—

"The No. 203 Heater purchased from you is working very satisfactorily, and if we have a chance, we shall of course, endeavor to use more of your heaters."



Autovent Unit Heater
Ceiling Type

Co-operation!

Our customers like the whole-hearted help that we give them. Our chief aim is to make every customer a satisfied one. And the word—*Co-operation*—tells how we do it.
You will like it too! Try us on your next job.

Estimates and prices cheerfully furnished by our Engineering Department.

AUTOVENT FAN & BLOWER CO.
730-738 W. Monroe St., CHICAGO
ENGINEERS IN ALL PRINCIPAL CITIES

to $118,736,400. This was the second highest January total on record for the district, although 39% under the record January of last year.

In New England States the contracts were $17,182,800, representing a decrease of 48% from December, and 33% from January, 1926.

In the Middle Atlantic States the total was $53,443,500, being 15% above December, and 54% above January, 1926.

A corresponding good showing was made in the Pittsburgh district, which represented a total of $50,057,700, an increase of 12% over December, and 29% over January of last year.

The figures for the Central West were $84,700,600, a loss of 33% from December but a gain of 7% over January, 1926.

For the Southeastern States the figures run $42,318,400, exceeding December by 8%, but declining from January of last year by 36%.

The Northwest had $2,490,800 worth of contracts, representing a decrease of 27% from December, and 38% from January, 1926.

In Texas the figures amounted to $15,525,200, a decline of 10% from December, and 13% from January, 1926.

Cecil W. Farrar, vice-president of the Excelso Specialty Works, Buffalo, N. Y., was the principal speaker at the January meeting of the Buffalo Master Plumbers' Association, when he talked on the subject of "Sales Psychology."

Buffalo Heating and Piping Contractors were addressed at a recent meeting on the subject of "Certified Heating." The speakers included A. R. Herske, manager of the Cleveland (Ohio) Association, and by Joseph C. Fitts, New York, assistant secretary of the Heating and Piping Contractors National Association.

Indianapolis, Ind.—How the cause of good heating may be hurt by its friends is illustrated in the case of the bill introduced in the Indiana legislature by Representative Thiel, providing for uniform temperature in certain classes of buildings. The temperature specified to be maintained from 7 A.M. until 10 P.M. in apartments, flats, office buildings or structures designed and rented for business purposes or human habitation, is 72° F. Manifestly this temperature would result in a condition which would play into the hands of the open-air advocates in producing overheating, to which they so strenuously object. Fortunately the proposed law does not refer to schools, coliseums, tabernacles or similar buildings which are now being so widely used for basketball tournaments and other athletic events.

Los Angeles.—In a full page advertisement in the Los Angeles daily papers, the Pacific Pipe & Supply Company advises the public that thereafter the company will sell heating and plumbing supplies direct to the public and will even undertake contracts for the installation of same. H. M. Haldeman, president of the company and formerly manager for the San Francisco branch of Crane Company, states that through the new policy the general public is given the advantage of obtaining plumbing supplies at a price it will be satisfied to pay, that the retailer is eliminated and the supplies, instead of being sold to the wholesaler and through him to the retailer as in the past, will go direct to the consumer. The claim is also set forth that this step is due to the evolution in business which demands a more satisfactory and economical installation of heating and plumbing work.

Urbana, Ill. J. F. Quereau has been added to the staff of the research investigators for the University of Illinois. Mr. Quereau is a graduate research assistant, half of his time being devoted to research work and the other half to graduate study in mechanical engineering.

PECCO
UNIT HEATERS

Complete Heating Satisfaction

Pecco Unit Heaters are uniformly effective because their design follows the fundamental laws of aerodynamics. They are built to heat all the air in the working zone in the building to the proper temperature. This is accomplished by (1) placing the cold air intake at the cold air level, (2) placing the warm air outlet at the warm air level, and (3) providing uniform air distribution by RE-CIRCULATION of all air in the open building space.

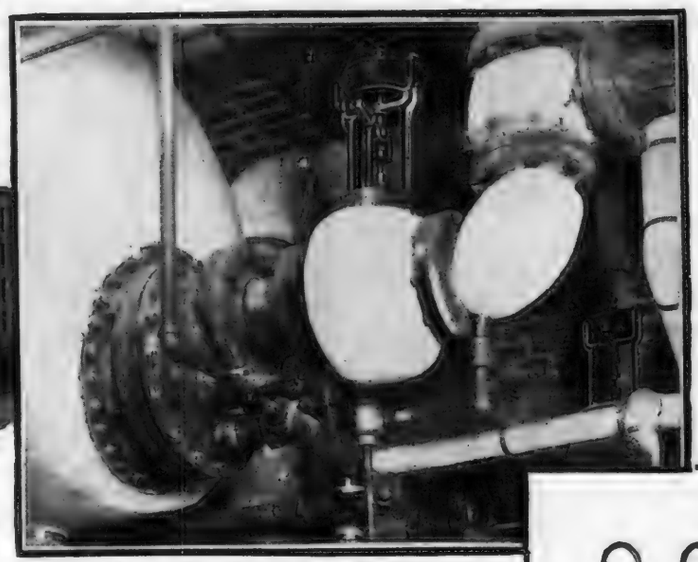
This external view shows some Pecco Unit Heater features. Note that the cold air intake fan is located where it belongs—near the floor at the cold air level.

PECCO, INCORPORATED, 2980 North Market Street, St. Louis, Mo.

Rankin, Kellogg & Crane, *Architects*
W. M. Anderson, *Heating Contractor*

Sylphon

Automatic Temperature Control of Service Hot Water in the New Philadelphia Inquirer Building



The two 6-inch No. 930 Sylphon Regulators used on large storage water heaters for all of the Inquirer Bldg. except the tower.

THE Philadelphia Inquirer Building is supplied with hot water under Sylphon automatic temperature control. Two 6-inch No. 930 Regulators, as shown in the installation photograph, are used on two large storage heaters, to which the steam is supplied at atmospheric pressure. These heaters furnish hot water for every part of the building except the tower.

Two 2-inch No. 930 Regulators are also used on hot water storage heaters on the fifth floor, which are operated with 35-lb. steam, and supply the hot water needed for the tower.

Thus, this entire building, which is one of the most modern of office buildings, besides housing an unusually complete newspaper printing plant, is sure of a constant supply of hot water at the right temperature and at minimum cost.

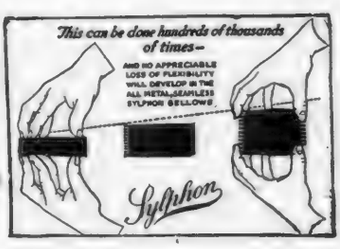
No. 930 Sylphon Temperature Regulator. Lever type for control of liquids.

Sylphon Regulators Are Self-Contained

There are no delicate or complicated auxiliaries to get out of order. Once installed and set, a Sylphon Regulator automatically maintains the desired temperature without attention or repairs.

You will make no mistake by using Sylphon Regulators on every service hot water system you install.

If you have not filed a copy of Bulletin WTR-110, ask us to send one.


This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL-SEAMLESS SYLPHON BELLOWS
Sylphon

The Sylphon Bellows, the motor element in every Sylphon instrument, is the most accurate, flexible and durable temperature control element in existence.

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales Offices in: New York, Chicago, Detroit, Boston, Philadelphia and all the principal cities in the U. S. A.

European Representatives:
Crosby Valve and Engineering Co., Ltd.
41-42 Foley Street, London, W. 1, England

Canadian Representatives:
Darling Bros., Ltd.
120 Prince Street, Montreal, Canada

Manufacturers' Notes

Pecco, Inc., St. Louis, Mo., announces the election of F. J. McMorran as President succeeding E. W. Puhl.

Modine Mfg. Co., Racine, Wis., has appointed C. J. Rice as sales manager. Mr. Rice was formerly President of the Sterling Eng. Co., Milwaukee, Wis.

Illinois Engineering Co., Chicago, Ill., has been awarded a Certificate of Merit by the Fifth National Exposition of Power and Mechanical Engineers for the special educational merit of its recent exhibit. Steam traps with glass tops were shown in actual operation under steam.

Absolute Con-tac-tor Corp., Elkhart, Ind., announces that George K. Culp has become associated with the organization as General Eastern Representative. Mr. Culp will have his headquarters in New York City.

Dunham Co., Berea, O., announces the appointment of O. A. Mayer as its representative in New York State outside of the Metropolitan area. His headquarters will be 509 Catherine Street, Syracuse, N. Y. The company also has appointed Jay J. Grosser as its representative in Cleveland, Toledo and Detroit, with headquarters at 1065 Orrville Ave., Cleveland, Ohio.

Illinois Engineering Co., Chicago, Ill., announces the removal of its Seattle, Washington, office to 518 Virginia St. W. A. Hill is the manager. The company has also appointed Jack Wheeler, formerly with Geo. B. Allen & Company, as its Oklahoma representative, with headquarters in Oklahoma City.

Gurney Heater Mfg. Co., Boston, Mass., announces the removal of its Philadelphia office to Twenty-first Street and Washington Avenue, Philadelphia, where the company's Philadelphia warehouse is located.

Union Radiator Co., Johnstown, Pa., announces that John J. Mellody has joined its organization and will be connected with the Pittsburgh office. Mr. Mellody was formerly connected with W. N. Sauer and G. F. Higgins of Pittsburgh.

Richmond Radiator Co., New York, informs us that H. B. Schroth, vice-president of the company, has been elected a member of the executive committee of the National Boiler and Radiator Manufacturers' Association; Mr. Schroth takes over the vacancy on the committee left by the death of the late William B. Reed.

Bishop and Babcock Sales Co., Cleveland, O., announces the appointment of J. D. Kimball as manager of the Cincinnati heating department. Mr. Kimball was previously connected with Massachusetts Blower Company and the B. F. Sturtevant Company.

May Oil Burner Co., Baltimore, Md., held a special conference of its sales representatives and sales managers at the company's executive offices in Baltimore, January 31-February 4, to make it possible for "Quiet May" merchants to realize greater prospects from their 1927 business. Four fundamental principles of successful oil-burner merchandising were discussed, including:

1. Personal calls on prospects;
2. Direct mail selling;
3. Local newspaper advertising; and
4. Store and window display.

To aid in applying these four fundamental principles, the direct-mail selling program, its co-operative plan of newspaper advertising and its advertising program in nationally-known publications, were major subjects of discussion at the four-day meeting.

International Combustion Engineering Corp., 43 Broad St., New York, has acquired the Heine Boiler Company, one of the leading water-tube boiler manufacturers. This gives the International Combustion Engineering Corporation large boiler shop facilities at St. Louis and Phoenixville. Pa. The acquisition of the Heine company will enable the International to furnish its customers complete steam generating units of its own manufacture. The deal, it is understood, calls for no new financing, as it was a cash transaction. C. R. Meier will remain president of the Heine company.

Landon Radiator Co., North Tonawanda, N. Y., has appointed W. F. Stearns vice-president in charge of sales. Mr. Stearns is well known in heating circles, having been for fifteen years sales manager of the New England branch of the American Radiator Company. For the past three years he has been a member of the firm of Stearns & Eaton, Boston, Mass., handling the products of the Utica Heater Company. Archer A. Landon is the president of the company, which is marketing a new line of radiators, including the Landon Invisible Shield, described as one of the greatest achievements in radiator construction.

American Radiator Co., New York, announces that Robert Baily, who has been representing this company in Seattle, Wash., for the past five years, has been appointed assistant manager of the Detroit branch.

A. T. Shrum, formerly with The McAlear Mfg. Co., of Chicago, Ill., is now president of the recently-organized Mechanical Equipment Co., Inc., 305 Louisville Trust Bldg., Louisville, Ky. This company represents the Garden City Fan Company, Economy Pumping Machinery Company, Milwaukee Valve Company, The McAlear Company, and the Powers Regulator Company.

Industrial Electric Motor and Tool Co., 1 Howard St., New York, announces that Alvin S. Rich, formerly of the Wagner Electric Corporation is now connected with its New York branch.

Wayne Heater Corp., Columbus, Ohio, announces the election of the following officers:

Henry Loudenschlager, president; C. C. Fulghum, vice-president; Charles Wilson, secretary and treasurer; H. C. Crites and W. E. Bowers, directors; W. E. Bowers, general manager.

Change of Address

Van Tuyl, Heartt & Barron, Detroit, Mich., announce the removal of their engineering office to 916 Francis Palms Building, Woodward Avenue & Elizabeth Street, Detroit, Mich.

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C. A. Dunham Company's Sales Conference

Announcement of a new constant differential vacuum heating system was the basis of a special sales conference held by the C. A. Dunham Co., at Chicago, January 14-15. This conference was attended by members of the sales organization from all over the country, as well as by the British representative from London and other representatives from Canada and New Foundland.

The whole conference was marked by originality in the program and a spirit of good fellowship on the part of the sales organization.

The formal announcement by C. A. Dunham of the new differential vacuum system was followed by a discussion on the theory of the differential vacuum system, by D. N. Crosthwait, and the design, application and installation of this system, by C. A. Thinn.

One of the novel features of the meeting was the employment of a comedian from the Keith Orpheum Circuit in the capacity of a waiter, at the banquet held at the Hotel Sherman, Chicago, at the conclusion of the conference. This was done entirely without the knowledge of the guests, who supposed that one of the regular waiters had slipped up on the Eighteenth Amendment, and, after insulting one or two of the guests, was ejected from the room. Later, when a wonderful cut (?) glass bowl was to be presented to C. M. Brigham by the members of the sales force, in some way the same waiter got hold of the bowl and in carrying it over to Mr. Brigham he fell and smashed the beautiful object into bits.

Those at the banquet naturally supposed that the whole presentation had been spoiled and the evening irreparably marred, until it was explained by the toastmaster that the waiter was in reality a comedian and the punch bowl only a pressed glass imitation.

William J. Woolley New President of Wolff Mfg. Corporation

William J. Woolley, nationally known as the former secretary-manager of the National Trade Extension Bureau, and, until recently, vice-president of the Wolff Mfg. Corporation and of the Pierce, Butler and Pierce Mfg. Corporation, of New York, manufacturer of boilers, radiators and pottery, has been elected president of the Wolff Mfg. Corporation, succeeding Dr. J. T. Duryea, who died January 30.

Mr. Woolley was one of the organizers of the National Trade Extension Bureau and served as secretary-manager of that institution until two years ago. At the time of his election as vice-president of the Pierce, Butler and Pierce Corporation it is known that Dr. Duryea planned to resign the cares of active administration as soon as the constructive program he then had in hand was completed. The company's principal products are plumbing fixtures and fittings.

Combating Sales Resistance in the Oil-Burner Industry

Mercoids for February, 1927, published by The Federal Gauge Company, Chicago, Ill., contains, as its leading article, a discussion of sales resistance in the oil-burner industry, contributed by Cliff W. Presdee, western manager, THE HEATING AND VENTILATING MAGAZINE. Mr. Presdee states that the public's lack of knowledge of oil burners is an important factor in oil burner sales resistance. One manufacturer, he states, has placed so much importance on the matter of oil-burner prospects consulting the authority in their community, that he has adopted a sales policy whereby all retail sales are made through recognized heating contractors.

Another factor in sales resistance, mentioned by Mr. Presdee, is the effect of installing an oil burner in an inadequate heating plant. Sometimes an oil burner installed in such a plant falls down miserably. This, he declared,

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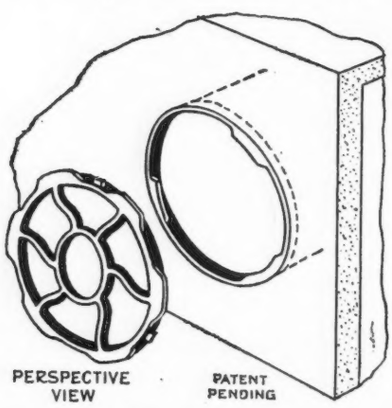

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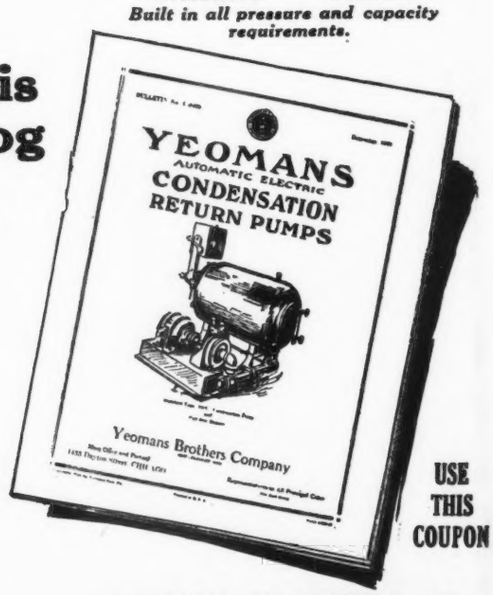

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A New Short Cut in Installing Column Radiators

YOU'RE well acquainted with the causes of trouble and delay in installing the legless type of radiator. Note how they are reduced by several special features in the new Grinnell Column Radiator Bracket.

It has only three points of contact; thus reducing the extent to which rough walls can slow up installation.

Only one bolt is required to secure it firm and fast.

An unusually wide range of adjustment is provided—both vertically and horizontally. Need for extremely accurate, time-wasting measurements is eliminated.

All these points are clearly illustrated in the descriptive pamphlet on this rugged time-saving bracket. Send for a copy or copies. Address Grinnell Company, Inc., 280 West Exchange Street, Providence, R. I.

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Pipe Bending, Welding, Piping Supplies, Etc.

hurts not only the manufacturer of that particular oil burner, but the entire industry. The oil burner is condemned but seldom, if ever, is the heating plant blamed.

At the annual meeting of the American Society of Mechanical Engineers in joint session with the American Society of Refrigeration Engineers in December last, a paper on the "State of Existing Data on Heat Transfer through Insulation in the Moderate and High-Temperature Fields" was presented by Dr. L. B. McMillan at the Heat Transfer Session arranged by the National Research Council

Dr. McMillan is the chief engineer of the Johns-Manville Corporation and among other items the paper covered the true meaning of conductivity, the significance of surface resistance, the effect of air velocity on heat transfer, the fact that surface temperature is no satisfactory measure of heat transfer and the result of the economic analysis.

MANUFACTURERS' SALESMAN WANTED—Manufacturer of complete line of blowers desires first class salesman to take over its Cleveland territory. Must know the blower game thoroughly, including heating, ventilating and air conditioning. Address Box 38, care of Heating and Ventilating Magazine.

MANUFACTURERS' AGENT—With twelve years sales experience in Chicago territory wants exclusive agency in Chicago and vicinity for high grade line of unit heaters, fans or other heating and ventilating equipment. Address Box 37, care of Heating and Ventilating Magazine.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITION WANTED—Heating and ventilating engineer and estimator, thoroughly experienced, desires connection as manager of heating department with contractor. Willing to consider financial investment. Address Box 31, care of Heating and Ventilating Magazine.

MECHANICAL ENGINEER WANTED—Manufacturer of low pressure steam specialties has opening for a graduate mechanical and heating engineer for work on designing and development; also some factory supervision. State age, salary expected and whether married or single. Address Box 32, care of Heating and Ventilating Magazine.

POSITION WANTED—Heating and Ventilating engineer, 28 years, desires position with large company only. Eleven years full experience in design and estimating of all systems, also plumbing. Able to handle men and supervise jobs. Address Box 33, care of Heating and Ventilating Magazine.

PHILADELPHIA SALESMAN WANTED—A manufacturer having a very complete line of steel heating and power boilers wants a competent representative. Must have thorough knowledge of the business, and acquaintance with trade, architects and engineers. Write giving age, education, experience and salary or compensation desired. Address Box 34, care of Heating and Ventilating Magazine.

SALES ENGINEER WANTED—Excellent opening for engineer accustomed to calling on industrial plants. Complete line of equipment for purifying air and water. Commission basis. Location New York and New Jersey. Address Box 35, care of Heating and Ventilating Magazine.

MANUFACTURERS' REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters desires recognized representatives on commission basis. Address Box 36, care of Heating and Ventilating Magazine.

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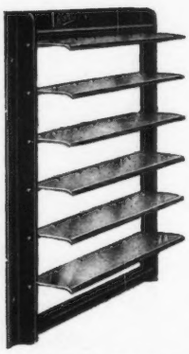

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